ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 27 PART 1

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## PART I

## TOPOGRAPHY, WATER, AND SEDIMENTS

BY

K. O. EMERY and JOBST HÜLSEMANN



UNIVERSITY OF SOUTHERN CALIFORNIA PRESS
LOS ANGELES, CALIFORNIA
1963

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 27 PART 1

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## PART I

## TOPOGRAPHY, WATER, AND SEDIMENTS

BY

K. O. EMERY and JOBST HÜLSEMANN



UNIVERSITY OF SOUTHERN CALIFORNIA PRESS
LOS ANGELES, CALIFORNIA
1963

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## Part I

## TOPOGRAPHY, WATER, AND SEDIMENTS

*by* K. O. EMERY and JOBST HÜLSEMANN

Allan Hancock Pacific Expeditions

Volume 27
Part I

Issued: May 10, 1963
Price: $3.00

University of Southern California Press
Los Angeles, California

# TABLE OF CONTENTS

## LIST OF FIGURES

# LIST OF TABLES

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## Part I. Topography, Water, and Sediments

by

K. O. Emery and Jobst Hülsemann

## INTRODUCTION

For many years submarine canyons have been known off southern California and have been studied in varying degrees of detail, largely by F. P. Shepard and his students and colleagues. Most of this work consisted of studies on topography (Shepard and Emery, 1941), lithology (Emery and Shepard, 1945), and general sediments (Cohee, 1938). Hydrographic and biological work has been sketchy. Some recent studies by Gorsline and Emery (1959) indicated the common presence of sandy floors along the canyon axes which mark the route of turbidity currents that move coarse sediment from beaches and inner shelves outward to the deep basin floors (Emery, 1960a). This preliminary sampling also suggested that benthic animals on the floors of the canyons differ from those at the same depths outside the canyons. Differences in environment, such as coarse sediment, moving sediment, or abnormal water conditions, may be important biological controls in the canyons.

Thirteen of the largest submarine canyons were selected for special studies of the topography, sediments, hydrography, and benthic biology. Many other canyons are present in the region, some of them larger than the smallest one described in this report. Among these fairly large but relatively poorly known canyons are several between Mugu and Hueneme Canyons, San Gabriel Canyon, Oceanside Canyon, Carlsbad Canyon, and several north and east of San Nicolas Island. These canyons were omitted not because they are unimportant, but because of time limitation and because the 13 canyons which were selected probably cover the range of variation expected within the fields of investigation. Basin slopes in the region also contain related but smaller features termed sea gullies (Buffington, 1951, in press; Emery and Terry, 1956): perhaps several thousand are present.

## ACKNOWLEDGMENTS

Most of the field work was accomplished between December 1959 and May 1960 (Stations 6776 to 7055) through the aid of National Science Foundation Grant G-9060. A few samples collected during 1961 and 1962 were by-products of an additional National Science Foundation Grant G-12329. Many of the data for Santa Monica, Redondo, and San Pedro Canyons were collected during short cruises extending back to 1951; most of these cruises were financed by Captain Allan Hancock, but some were part of a contract for studies of Santa Monica Bay for Hyperion Engineers, Incorporated. Appreciation is due J. R. Grady for his careful analyses for nutrients in the waters and to many other students of the Department of Geology who participated in the ship work during class or special field trips. All field measurements were made aboard the Allan Hancock Foundation's research vessel VELERO IV.

## TOPOGRAPHY

### Methods

The 13 submarine canyons of this study occur along the mainland and off islands and banks (Fig. 1). For each of them 6 to 13 sounding lines were run at right angles to the canyon axis, as shown by navigational charts, and at approximately equal intervals along it. The lines are long enough to show the relationship between the sides of the canyons and the adjacent mainland or island shelf, basin slope, or basin floor. Soundings were made with the Precision Depth Recorder (Luskin, Heezen, Ewing, and Landisman, 1954) attached to an Edo echo sounder. Instrumental error is less than 1 part in 3000, so the chief error in depth results from variation of the speed of sound in sea water and the reflection of sound from areas of the bottom within the sound cone and shallower than the point directly beneath the ship. The profiles are based upon soundings uncorrected for sound velocity. Since the echo sounder is calibrated for a sound velocity in sea water of 1463 meters per second and the actual sound velocity for these depths is about 1.2 per cent faster (Emery, 1960b), the profiles are about 1.2 per cent too shallow. More important, however, is the effect of echoes from the sides of the narrow canyons; these often obscure the echoes from the narrow bottom. Comparison of wire depths for samples taken in the canyons with simultaneous echo soundings corrected for sound velocity show that some of the echo soundings are as much as 50 meters too

shallow, with greatest errors in the narrowest part of the canyons (Fig. 2). In contrast, the average difference between wire and echo depths for flat shelves and basin floors is less than about 3 meters.

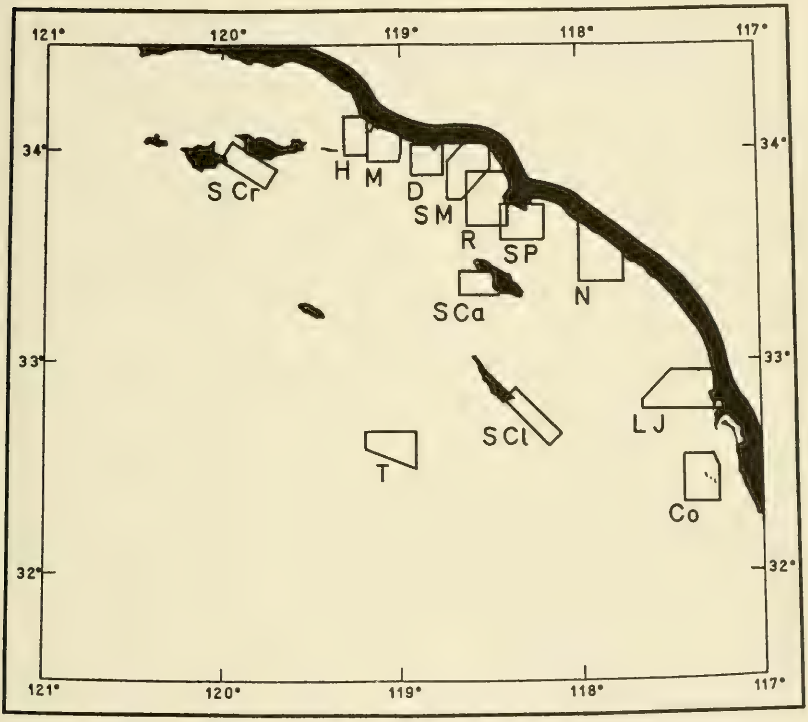



Fig. 1.—Index map showing areas which were sounded and sampled off southern California, for which contours, profiles, and sample positions are shown in Figures 3 through 15.

H, Hueneme Canyon; M, Mugu Canyon; D, Dume Canyon; SM, Santa Monica Canyon; R, Redondo Canyon; SP, San Pedro Sea Valley; N, Newport Canyon; LJ, La Jolla Canyon; Co, Coronado Canyon; SCr, Santa Cruz Canyon; SCa, Santa Catalina Canyon; SCI, San Clemente "Rift Valley," T, Tanner Canyon.

Positions were determined at 5-minute intervals by a radar range and bearing on a prominent coastal point, such as a pier end or a steep cliff. Since the ship speed was 9 to 10 knots, positions are about 1.5 km apart.

In the laboratory the tapes of continuously recorded soundings were reduced to half scale with a pantograph and the reductions were traced directly for Figures 3 through 15. U.S. Coast and Geodetic Survey navigational charts served as the source for contours of the index map for each of the canyons.

## Characteristics

*General:*—The canyons off southern California have been described previously by Shepard and Emery (1941) and by Emery (1960a) who also summarized the pertinent literature on them. Accordingly, only new data on topography and data needed for the proper interpretation of water characteristics and sediments will be presented here.

The canyons occupy parts of three physiographic environments of the sea floor: continental or insular shelf, basin slope, and basin floor. In each environment the canyons present a different aspect.

*Shelf Portion:*—The shelf is largely or entirely crossed by 8 of the 13 canyons of this study. Santa Monica, San Pedro, and Coronado canyons only indent the shelf; however, filled extensions of all three canyons are known on the adjacent land through well borings, and a filled channel across the shelf from the head of San Pedro Sea Valley was discovered by jet borings made by Richfield Oil Company. The other two exceptions are Tanner Canyon which begins deep on the saddle between Cortes and Tanner banks, and San Clemente Rift Valley which is different in many ways from other submarine canyons. Among the 8 canyons which do cross most of the shelf, Hueneme, Redondo, and Newport have now-filled extensions on land, as shown again by well borings. Each of the 8 also lies off a prominent land valley, except Santa Cruz Canyon which heads into the shelf saddle between Santa Cruz and Santa Rosa islands. Hueneme, Redondo, Newport, La Jolla, Santa Cruz, and Santa Catalina extend in nearly straight courses across the shelves, but Mugu and Dume are broadly curved.

The depth of the canyon edge, or lip, is not uniform across the shelves. Transverse profiles across the shelf portions of Hueneme, Mugu, Santa Monica, Redondo, San Pedro, Newport, La Jolla, Coronado, and Santa Catalina canyons (see Figs. 3-15) show a seaward deepening of the canyon edge. This deepening is somewhat greater than the general slope of the shelf and, moreover, the profiles show some lateral slope of the shelf toward the canyons. Both facts mean that the topographic effect of the canyons extends somewhat beyond the narrow gorge of the canyons.

Below the canyon edge, the profiles show steep slopes—too steep in fact for completely satisfactory use of an essentially non-directional echo sounder. The measured slopes are minimal ones; still, as shown by the left-hand part of the top panel of Figure 16, the indicated slopes of the

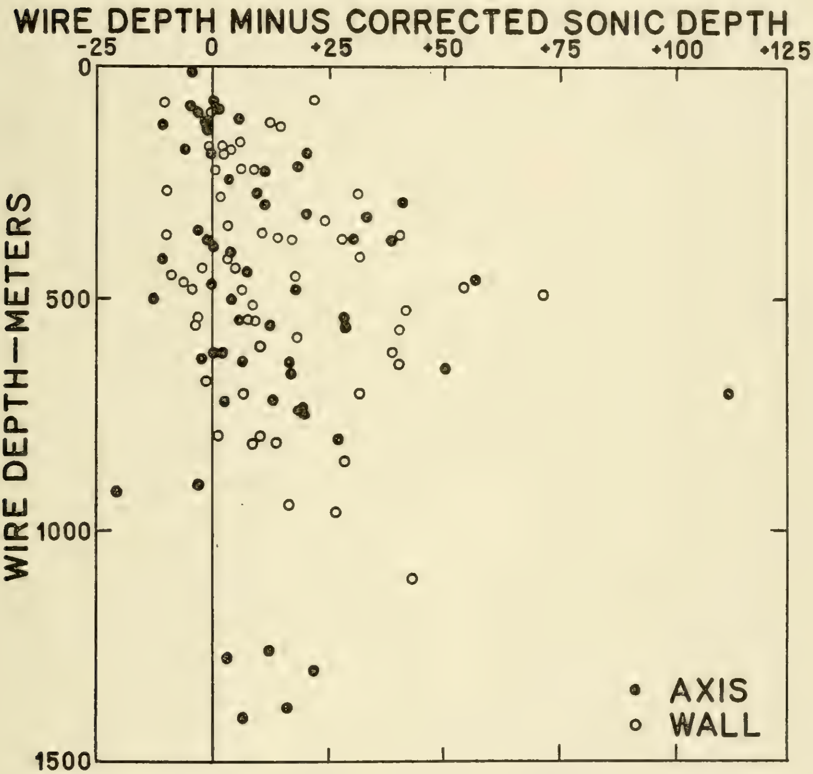



Fig. 2.—Plot of difference between wire depth and sonic depth corrected for sound velocity. The dominantly shallower sonic depth is the result of echoes from steep canyon walls which obscure the echo from directly beneath the ship. The sounding differences at sites in canyon axes and on canyon side walls are similar.

walls nearest the heads of the canyons are 10° to 40°. Observations made by divers in shallower waters reveal yet steeper, even vertical to overhanging walls. These parts of the submarine canyons probably represent the steepest areas of the sea floor.

Shepard and Beard (1938) reported that the axial slope of California submarine canyons is steepest at the head—14.5°, moderate at the middle—5.5°, and gentlest at the seaward end—4.0°. The new profiles were made too far from the shallows at the heads of the canyons to cross the steepest part of the canyon axes, but axial slopes which they did encounter in the shelf portions usually exceeded 5°. All except three canyons (Coronado, Santa Catalina, and Tanner) have longitudinal profiles that are concave upward. As shown by Figure 16, there is only a slight correlation between steepness of canyon walls and of canyon axes.

Heights of canyon walls in the shelf portion range upward to 480 meters and average about 170 meters. In five canyons (Hueneme, Santa Monica, Redondo, Newport, and Santa Cruz) the greatest wall heights occur at the outer part of the shelves; in all the others, the greatest heights are slightly farther seaward, near the top of the basin slopes.

*Basin-slope Portion:*—Basin slopes in the region average about 8°. The portion of some of the canyons traversing the basin slope is longer than that across the shelf, but for other canyons the reverse is true. All except Newport, San Clemente, and Tanner canyons have broadly curved courses down the basin slopes. For four canyons the curvature is to the right and for six to the left; this curvature appears to be the result of differential erosion along structural irregularities in the basin slopes.

Just as for the shelf portions, the intersections of the canyon walls with the basin slopes are not usually abrupt, but the basin slopes bend gradually inward toward the canyons. Indicated steepnesses of the canyon walls range up to 40°, averaging slightly less than for the shelf portion. In both portions the opposite walls exhibit considerable asymmetry, with one-third of all pairs of profiles having one wall more than twice as steep as the opposite wall. Heights of the walls range up to 500 meters and average 170 meters for 79 measurements, the same as the average for the shelf portions of the canyons. The heights of both walls are about equal, except where the canyon lies at the foot of a basin slope.

The echograms present a minimum width of the canyon floors because of reflections from the canyon walls, as discussed also by Northrop (1953) for Hudson Canyon. Often a faint echo from a horizontal surface can be detected through the traces produced by echoes from the walls. This faint echo, the presence of flat bottoms on some echograms, the collection of several samples from about the same wire depth on a profile across a canyon, plus the observations of divers in shallow water indicate that the canyons in both shelf and slope portions may have flat

floors. The width is uncertain but it is believed to commonly range up to 200 meters.

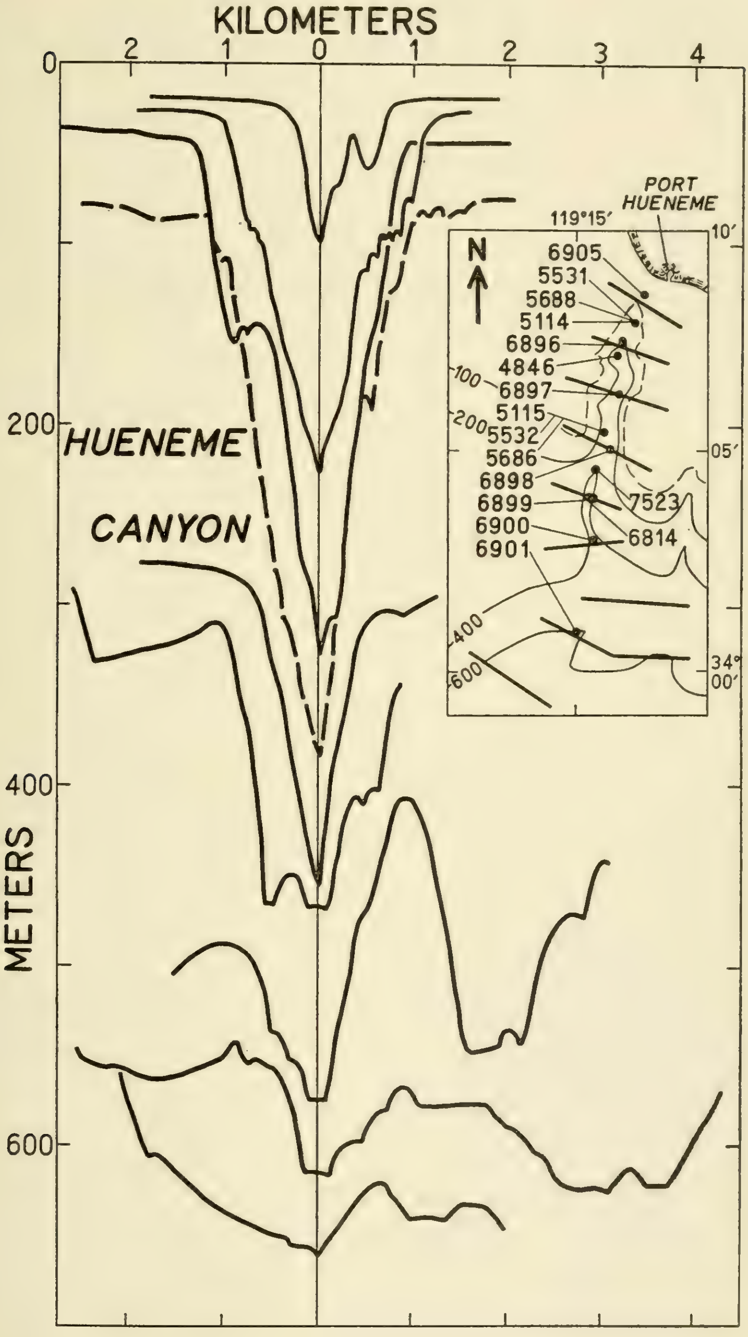
*Basin-floor Portion:*—At the foot of the basin slopes both the general bottom topography and the canyons exhibit a change. The general steepness is much less and both contours and samples show that the basin slope is bordered by a broad concave fan or apron built up of sediments carried through the submarine canyons (Gorsline and Emery, 1959; Emery, 1960b). Fans from adjacent canyons may coalesce to form a general bajada-like feature whose steepness ranges downward from about 1.5°. Beyond the fans are basin plains which are so flat that the depth may change only 1 meter in 6 km.

Extensions of the submarine canyons have been recognized only across the fans, where they take the form of low winding channels. These channels are bordered by natural levees which often cause the floor of the channel to be higher than the surface of the adjacent fan. Such levees are shown by profiles for Mugu, Dume, Santa Monica, Redondo, San Pedro, Newport, La Jolla, Coronado, Santa Cruz, and Santa Catalina canyons and they may occur at others. The first recognition of levees in the region appears to have been by Buffington (1952) for San Pedro, Newport and La Jolla canyons. Heights of the levees above the channels range up to about 50 meters, but 25 meters is probably a better average height. The channels are probably less than 200 meters wide and their axial slopes range from 3° to 0.4°, as shown by the data of Figure 16.

## Lithology and Age

Rocks have been dredged from the walls of many of the canyons. Most common are sedimentary and volcanic rocks of Miocene age (Fig. 17). Pliocene shales were obtained at San Pedro Sea Valley, San Gabriel Canyon (about 20 km east of San Pedro Sea Valley), and Coronado Canyon. Landward extensions of canyons have been filled with Recent sediments. Therefore, the age of the canyons is pre-Recent and at least parts of some of them are post-Pliocene. The strata which crop out on the walls represent seaward extensions of the same strata encountered in outcrops or in wells on the adjacent land, but not enough samples are available to reveal the tops and bottoms of individual beds or to show whether the beds dip seaward or have structural peculiarities.

Fig. 3.—Hueneme Canyon. Profiles with (X 19) vertical exaggeration. Insert map with contours in meters shows positions of profiles, bottom samples (solid dots), and hydrographic casts (circles).



KILOMETERS
2 1 0 1 2 3 4
0
200
400
600
METERS
HUENEME
CANYON
PORT
HUENEME
119°15′
10′
05′
34°
00′
N
6905
5531
5688
5114
6896
4846
100
6897
5115
200
5532
5686
6898
7523
6899
6814
6900
6901
400
600

Fig. 4.—Mugu Canyon. Symbols same as for Figure 3.

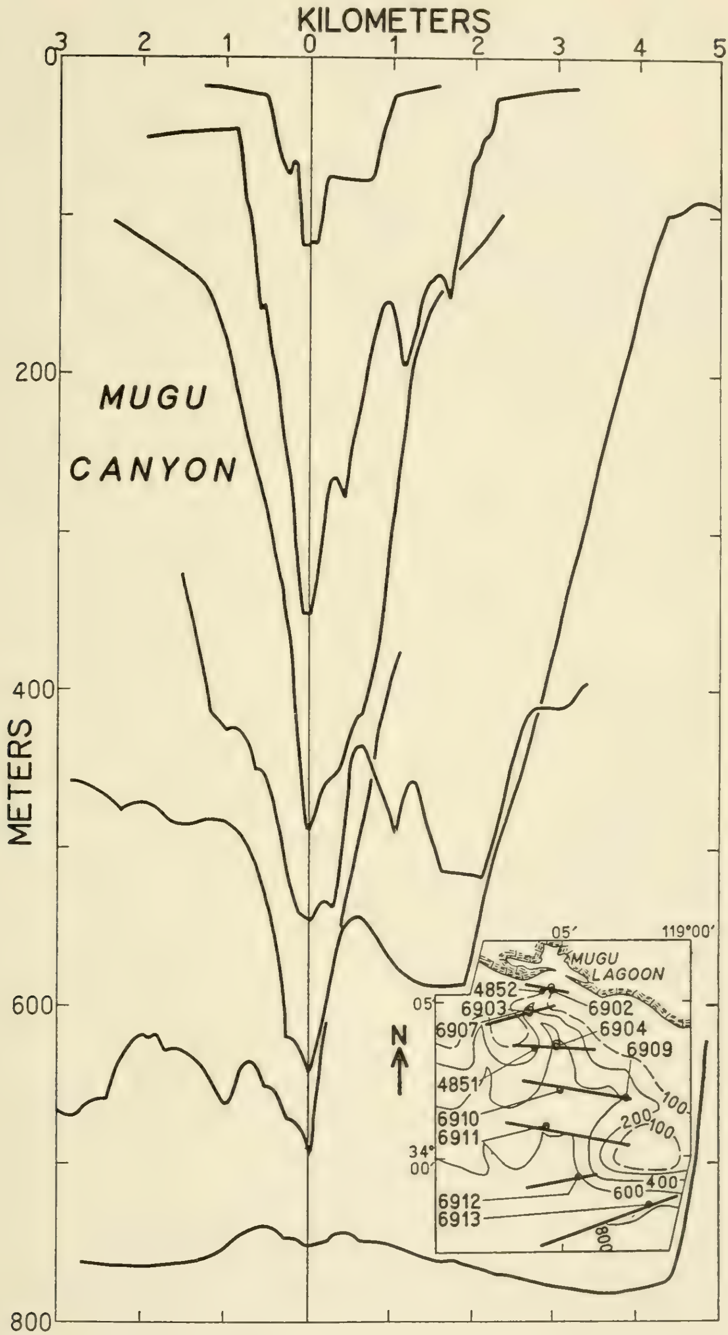

KILOMETERS
3
2
1
0
1
2
3
4
5
0
200
400
600
800
METERS
MUGU
CANYON
05'
119°00'
MUGU
LAGOON
4852
6902
6903
6907
6904
6909
4851
100
6910
6911
200
100
34°
00'
400
600
6912
6913
800
N

Fig. 5.—Dume Canyon. Symbols same as for Figure 3.

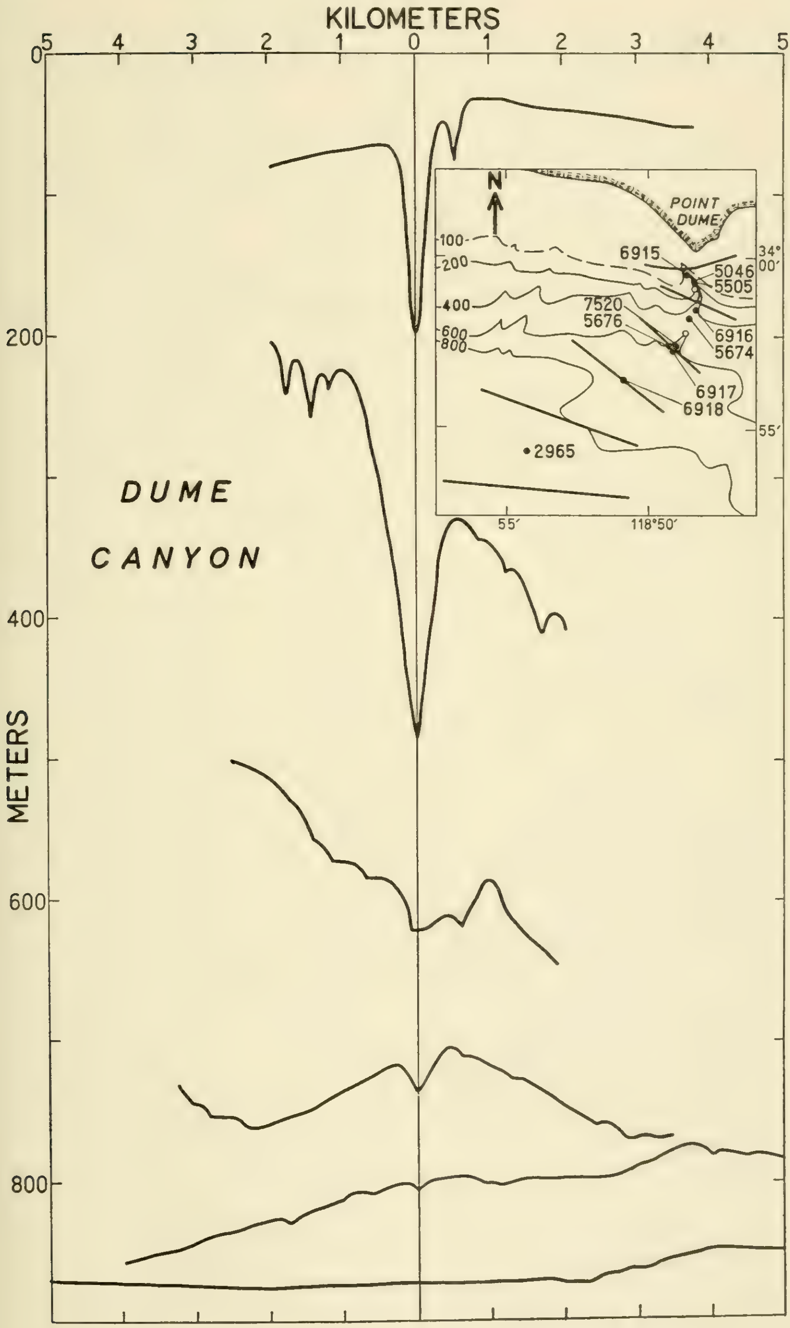

KILOMETERS
5
4
3
2
1
0
1
2
3
4
5
0
200
400
600
800
METERS
DUME
CANYON
N
POINT
DUME
100
200
400
600
800
6915
5046
5505
7520
5676
6916
5674
6917
6918
2965
34°
00′
55′
55′
118°50′

Fig. 6.—Santa Monica Canyon. Symbols same as for Figure 3.

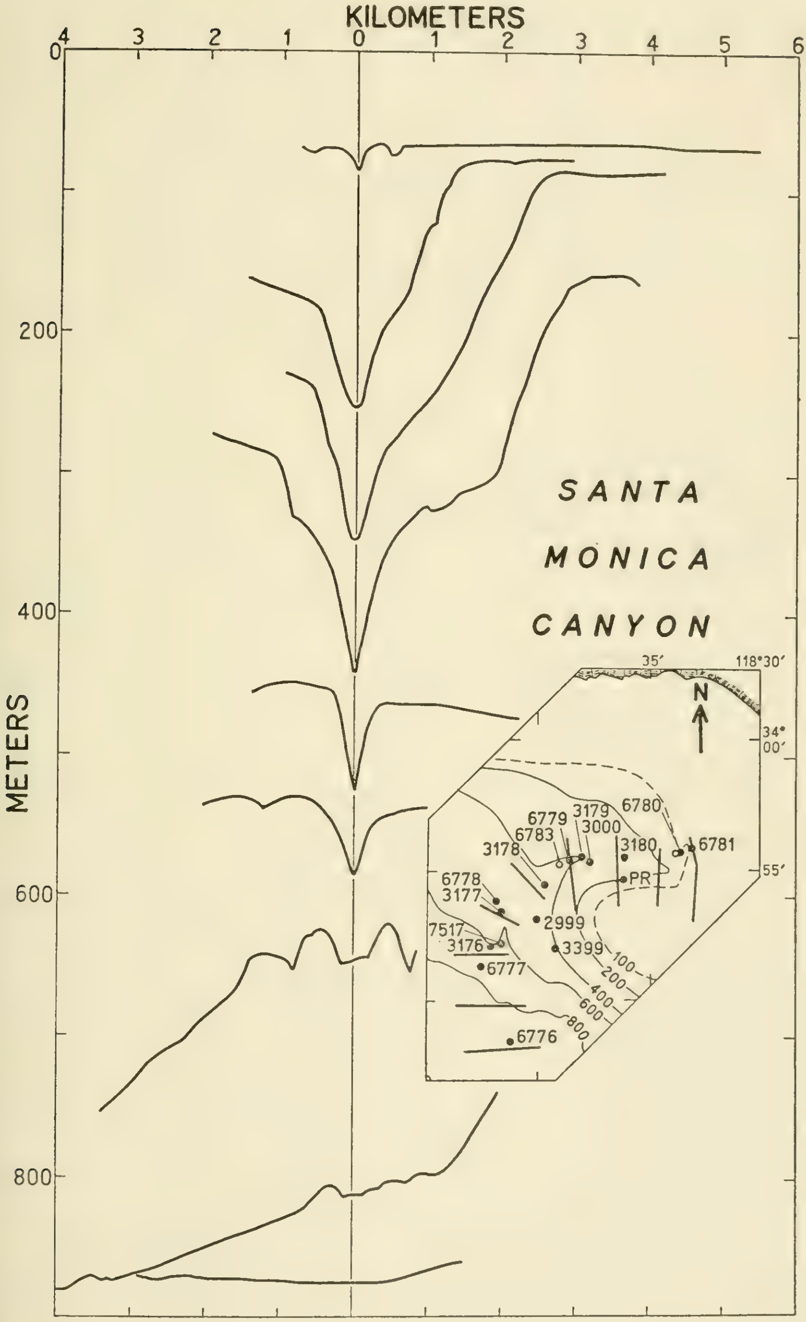

KILOMETERS
4 3 2 1 0 1 2 3 4 5 6
METERS
0
200
400
600
800
SANTA MONICA CANYON
35′
118°30′
N
34° 00′
55′
6779
3179
6780
6783
3000
3178
3180
6781
PR
6778
3177
2999
7517
3176
3399
6777
100
200
400
600
800
6776

Fig. 7.—Redondo Canyon. Symbols same as for Figure 3.

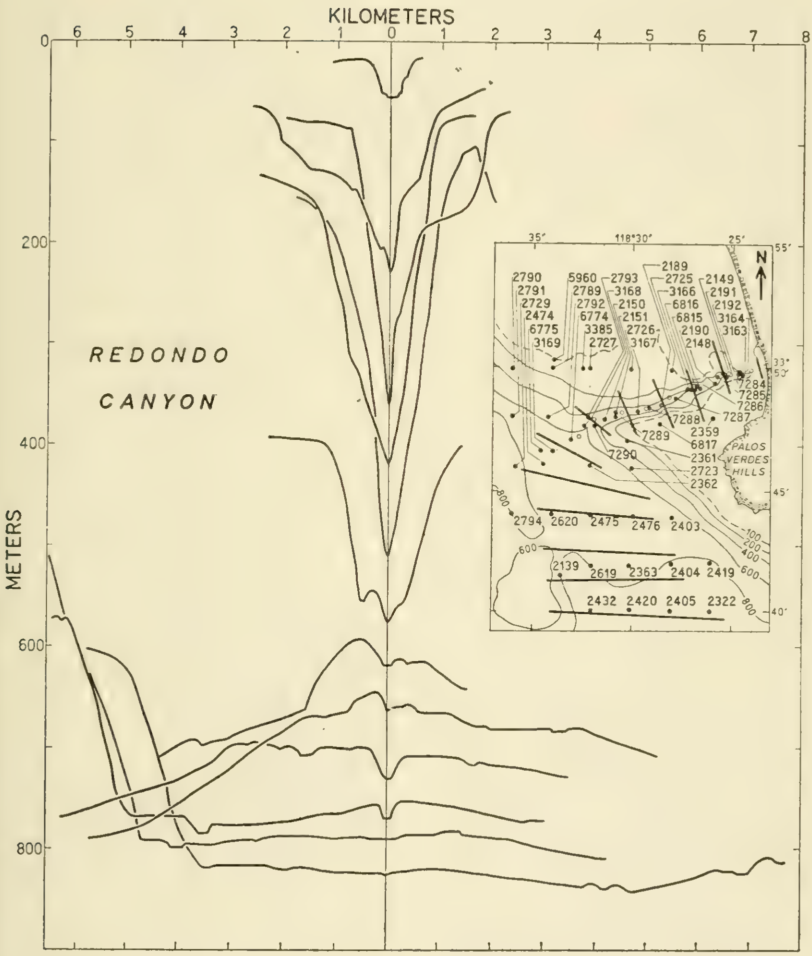

KILOMETERS
METERS
REDONDO
CANYON
PALOS
VERDES
HILLS
N
118°30'

Fig. 8.—San Pedro Sea Valley. Symbols same as for Figure 3.

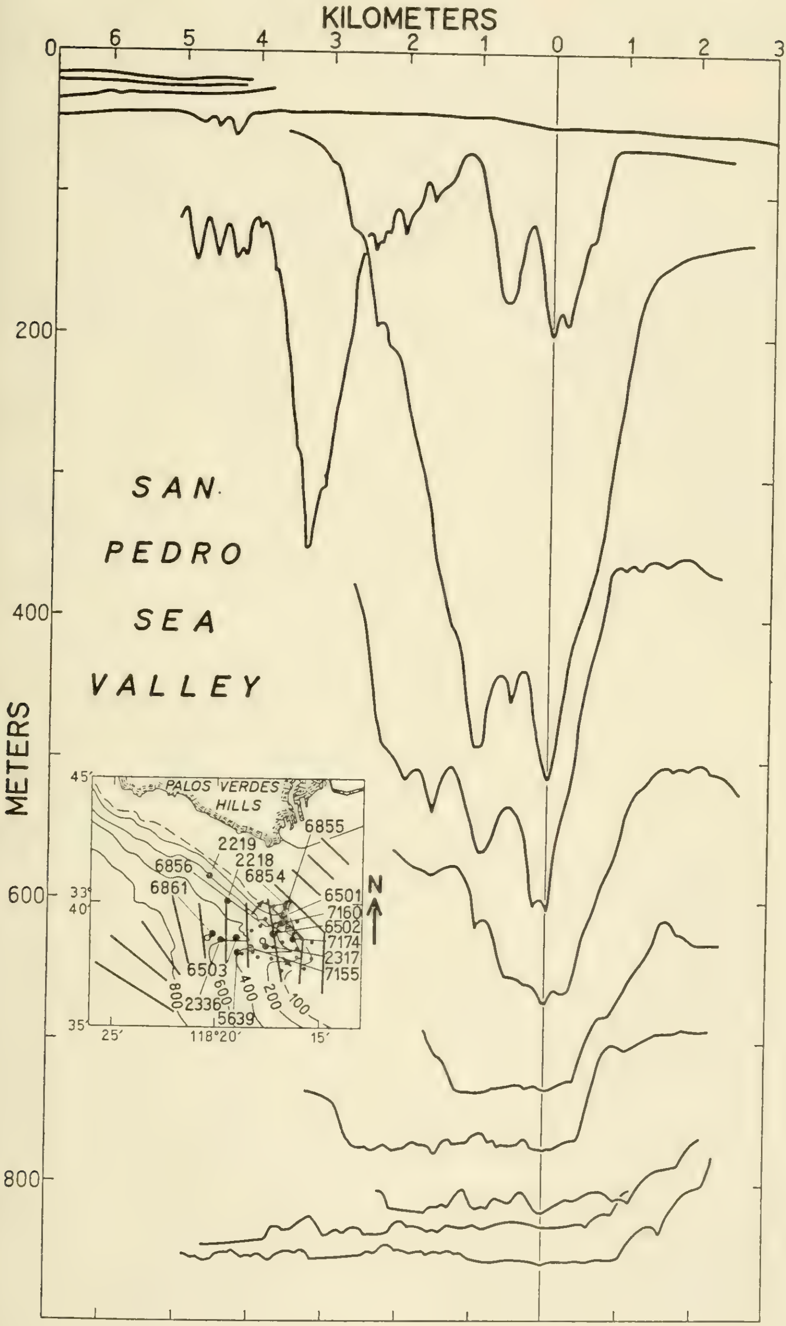

KILOMETERS
6
5
4
3
2
1
0
1
2
3
0
200
400
600
800
METERS
SAN
PEDRO
SEA
VALLEY
PALOS VERDES
HILLS
6855
2219
2218
6856
6854
6861
6501
7160
6502
7174
2317
7155
6503
2336
5639
800
600
400
200
100
N
45'
33°
40'
35'
25'
118°20'
15'

Fig. 9.—Newport Canyon. Symbols same as for Figure 3.

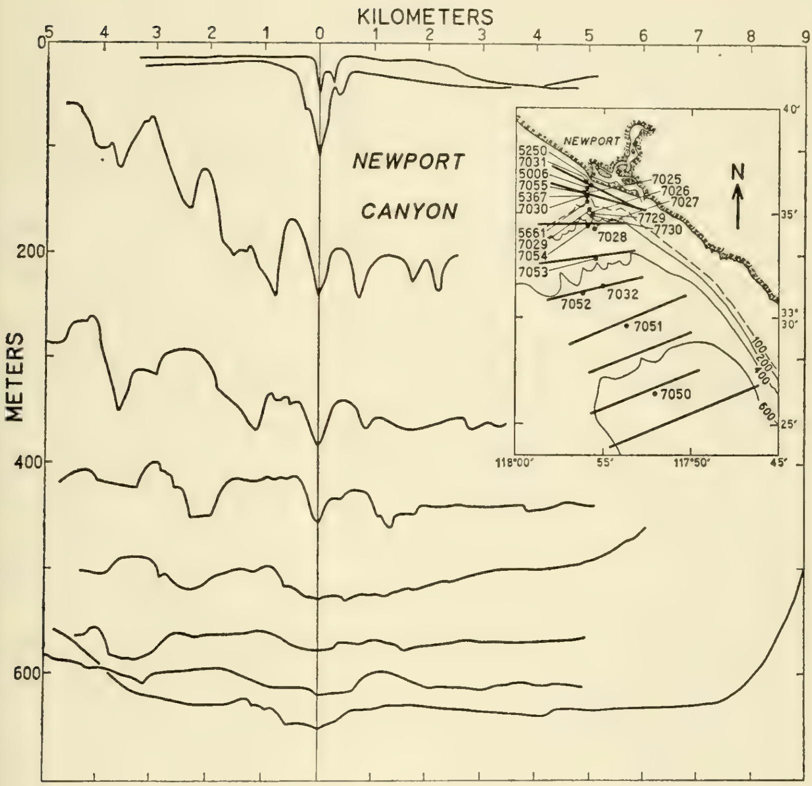

KILOMETERS
5 4 3 2 1 0 1 2 3 4 5 6 7 8 9
METERS
0
200
400
600
NEWPORT
CANYON
NEWPORT
N
5250
7031
5006
7055
5367
7030
5661
7029
7054
7053
7025
7026
7027
7729
7730
7028
7032
7052
7051
7050
100
200
400
600
40′
35′
33° 30′
25′
118°00′
55′
117°50′
45′

Fig. 10.—La Jolla Canyon. Symbols same as for Figure 3.

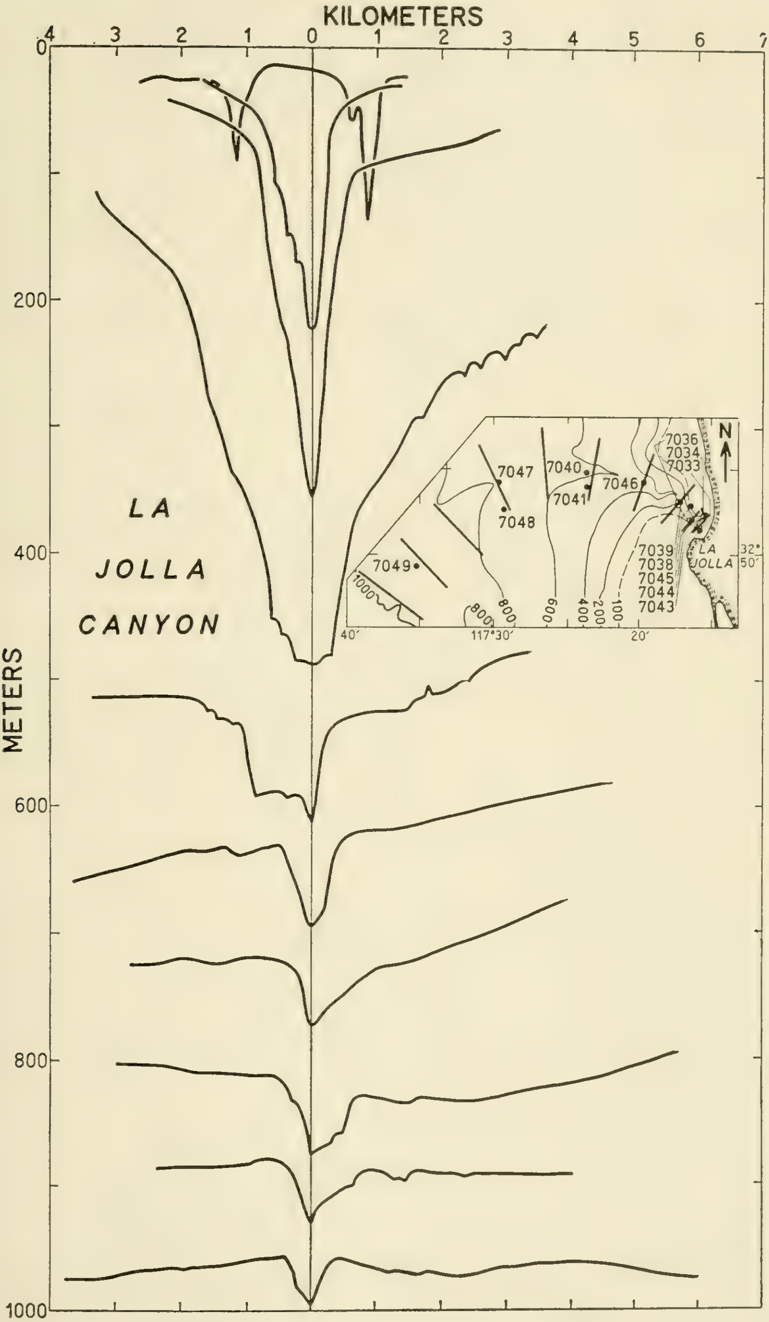

KILOMETERS
4
3
2
1
0
1
2
3
4
5
6
7
0
200
400
600
800
1000
METERS
LA
JOLLA
CANYON
N
7036
7034
7033
7047
7040
7046
7041
7048
7049
7039
7038
7045
7044
7043
LA
JOLLA
32°
50′
1000
800
800
600
400
200
100
40′
117°30′
20′

Fig. 11.—Coronado Canyon. Symbols same as for Figure 3.

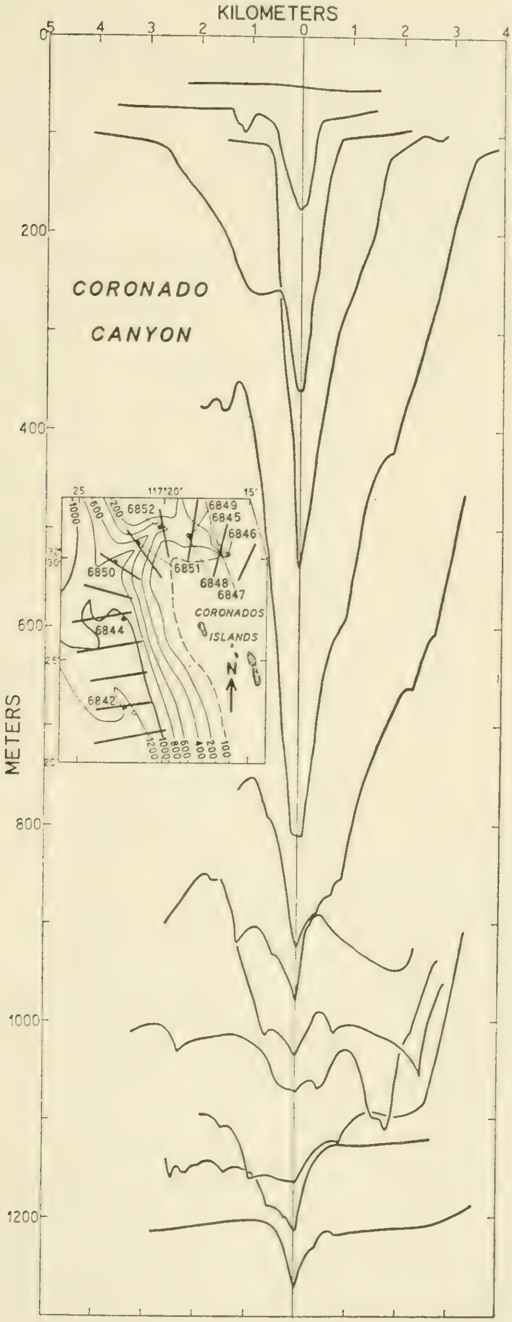

KILOMETERS
5 4 3 2 1 0 1 2 3 4
0
200
400
600
800
1000
1200
METERS
CORONADO
CANYON
25
117°20′
15′
1000
600
200
6852
6849
6845
6846
6850
6851
6848
6847
CORONADOS
ISLANDS
6844
N
6842
1200
1000
800
600
400
200
100

Fig. 12.—Santa Cruz Canyon. Symbols same as for Figure 3.

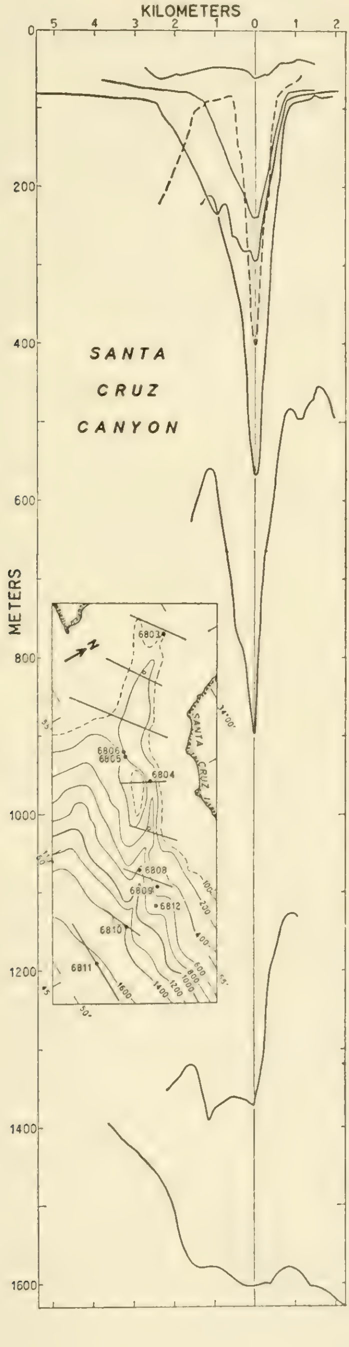

KILOMETERS
5
4
3
2
1
0
1
2
0
200
400
600
800
1000
1200
1400
1600
METERS
SANTA
CRUZ
CANYON
N
6803
6806
6805
6804
6808
6809
6812
6810
6811
SANTA CRUZ
34°00'
100
200
400
600
800
1000
1200
1400
1600

Fig. 13.—Santa Catalina Canyon. Symbols same as for Figure 3.


KILOMETERS
5 4 3 2 1 0 1 2 3 4 5
0
200
400
600
800
1000
1200
METERS
SANTA
CATALINA
CANYON
N
6831
6830
6821
6820
40'
35'
25'
33°
20'
1000
800
600
200
100
1200
6829
2847
6828
6823
6822
6818
6819

Fig. 14.—San Clemente "Rift Valley." Symbols same as for Figure 3.

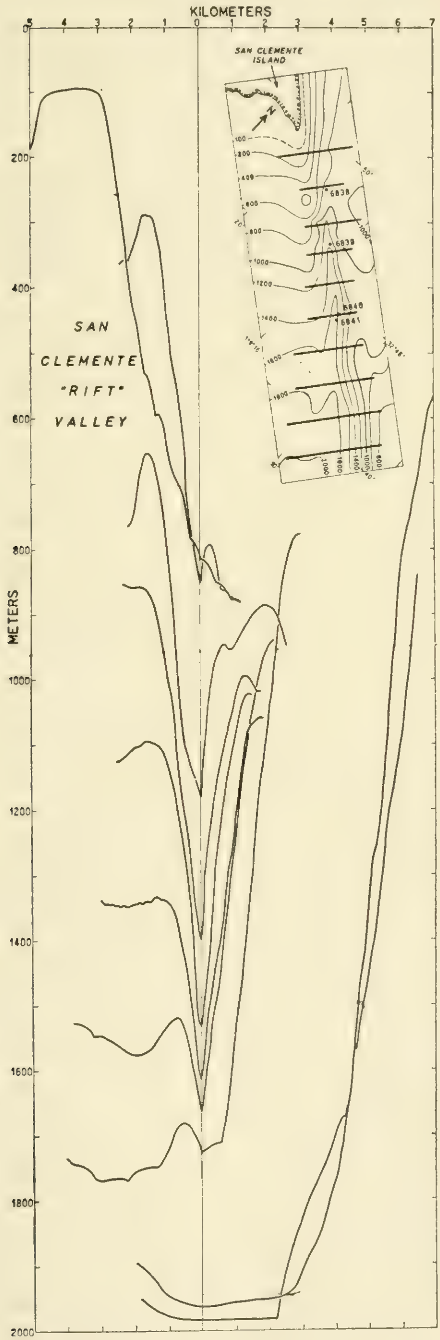
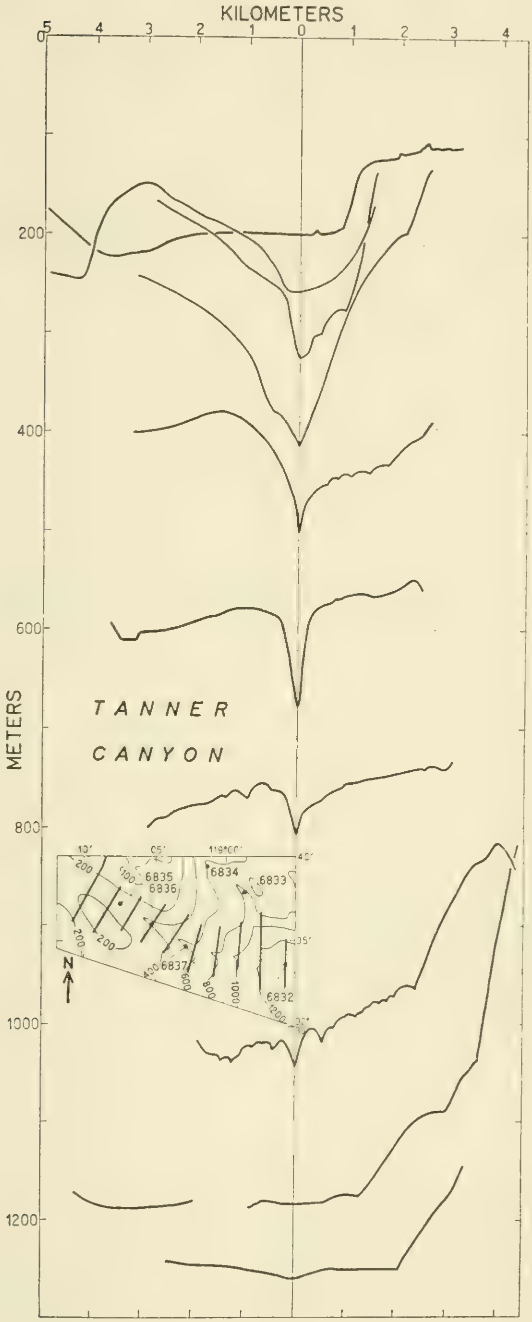

KILOMETERS
5 4 3 2 1 0 1 2 3 4 5 6 7
METERS
0
200
400
600
800
1000
1200
1400
1600
1800
2000
SAN CLEMENTE "RIFT" VALLEY
SAN CLEMENTE ISLAND
N
100
200
400
600
800
1000
1200
1400
1600
1800
6838
6839
6840
6841
2000
1800
1400
1000
600

Fig. 15.—Tanner Canyon. Symbols same as for Figure 3.


KILOMETERS
5
4
3
2
1
0
1
2
3
4
0
200
400
600
800
1000
1200
METERS
TANNER
CANYON
6835
6836
6834
6833
6837
6832
N

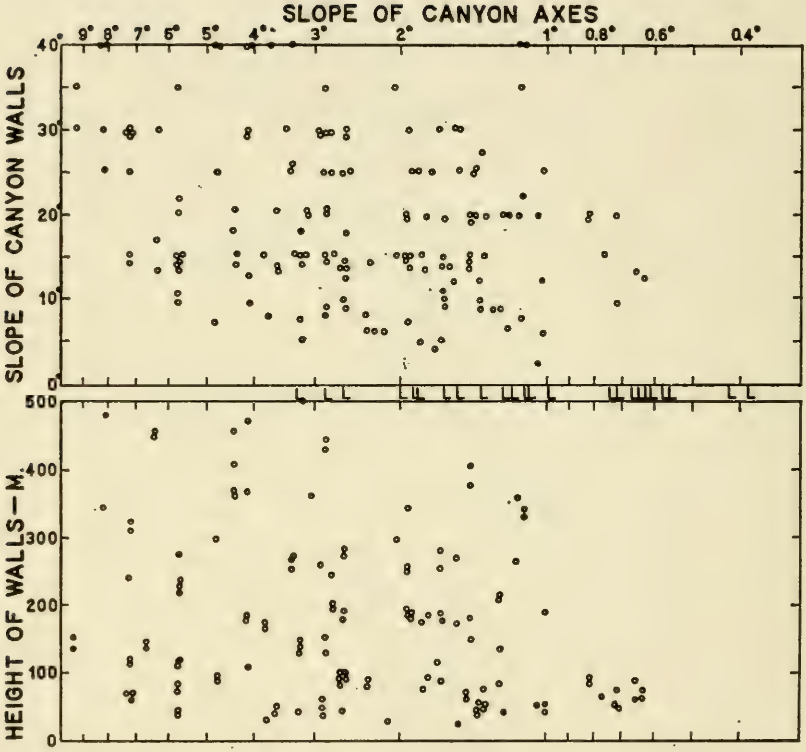



Fig. 16.—Relationships of wall steepness and height to slope of canyon axes. Symbol *L* indicates presence of natural levees.

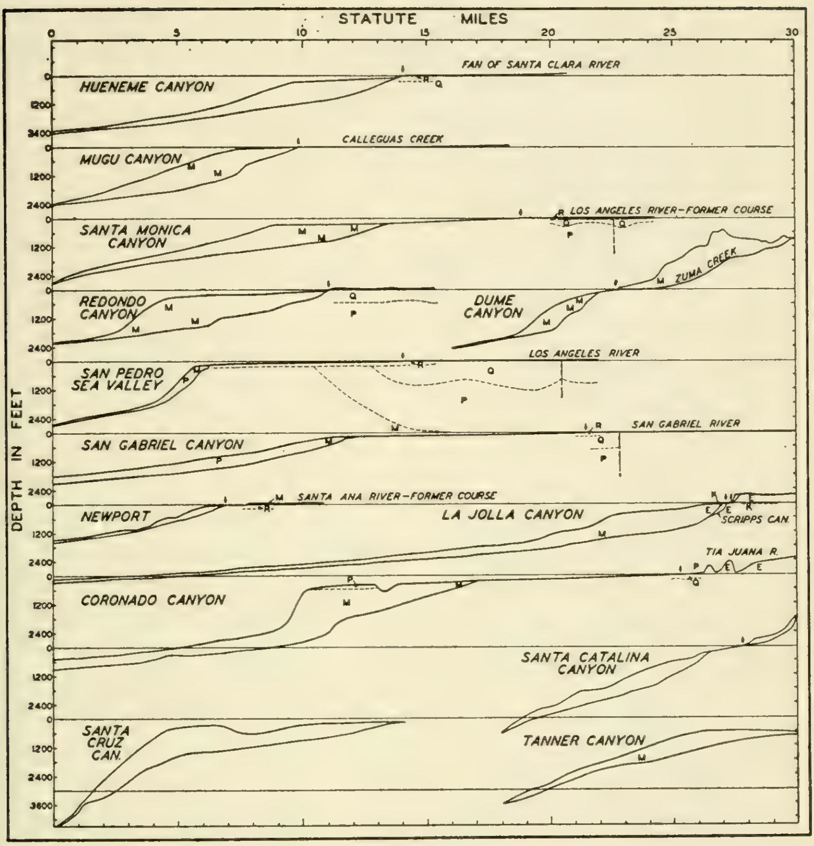



Fig. 17.—Profiles of submarine canyons compared with lithology where known. Symbols are as follows: arrow, shoreline; K, Cretaceous; E, Eocene; M, Miocene; P, Pliocene; Q, Quaternary; R, postglacial (on sea floor letters show sites of dateable rock samples). From Emery (1960a, fig. 48).

## WATER

Those who have spent much time aboard ship watching traces being drawn by echo sounders frequently observe echoes from dense schools of fish which are often present at the tops of slopes, including those at the sides and heads of submarine canyons. Some verification is provided by the reportedly greater catch of fish at the head and sides

of the canyons than on the nearby shelf. It has been suggested that fish are concentrated in these areas because of the presence of abundant food brought by currents from deep in the canyons. Many of the fish caught from piers at the heads of Redondo and Newport canyons are species characteristic of deep cold water, confirming the observation by some skin divers that water may be colder at the head of a canyon than at either side and that at times the water appears to be rising from the canyon. A few current-meter measurements in six canyons of the area (Shepard, Revelle, and Dietz, 1939) showed flows in the direction of the canyon axes but with no preference for up or down canyon. Possibly the water moves too slowly to be indicated reliably by such meters; a better technique might be the measurement of properties of the water itself.

Two to eight water stations were occupied along the axes of most of the 13 canyons at positions shown by open circles in Figure 3 through 15. Each station was positioned over the canyon axis by first making a topographic profile and then by stopping the ship at such a position that it would drift over the deepest point of the profile by the time that water-sampling gear had been lowered. In a few instances the drift varied so that the station was slightly to one side of the axis. Water samples were collected in Nansen bottles carrying two protected reversing thermometers. In Redondo Canyon a series of four water samples were obtained at each station just above the bottom through use of a bottom water sampler described by Rittenberg, Emery, and Orr (1955).

For each sample, temperature was corrected from the reversing thermometers, salinity was computed from standard titration for chloride, oxygen content was measured by Winkler analysis, and contents of silicate, phosphate, and nitrate were determined by standard colorometric methods using a Beckman DU spectrophotometer. The results are listed in Table 1 for the eleven canyons which were sampled. Profiles of six canyons with positions of water samples are presented in Figure 18, and more completely with water characteristics for Redondo Canyon in Figure 19.

The measurements show no marked difference in the character of the water at the canyon head from that near the seaward end of the canyon. The water is also within the range of seasonal and areal variation of that in the adjacent basins (Emery, 1954). Close examination of Table 1 and Figure 19, however, does show some slight inclination

of the isopleths in a few of the canyons. At Redondo Canyon the temperature and oxygen content is higher and the salinity and nutrients are lower near the head than farther seaward. This difference is just what is to be expected of local upwelling. A similar conclusion is indicated by the less complete data at Dume Canyon, but on the other hand possible downwelling may have occurred at Mugu and La Jolla canyons. Clearly, upwelling was not marked at the times of the surveys, but then the wind and sea conditions were fairly calm at these times. At times of strong winds, movements of water along the canyons may be more intense.

It seems evident that the water is not of such unusual character as to present an abnormal environment for benthic animals; thus any abnormalities in size of individuals or groupings of the fauna must be due to some aspect of the environment other than the water within the canyon.

A major abnormality in the benthic fauna is indicated by the fact that 22 samples from six canyons (Table 2) consist almost exclusively of *Capitella,* a polychaete worm which ordinarily lives in estuarine water (Hartman, 1962). These same samples are free of marine worms and of other marine animals except carnivores such as squid, which may not really inhabit the sites. Since *Capitella* lays its eggs in the tubes in which it lives, wide dispersion through sea water is unlikely. It is suggested that the samples represent sites at which fresh water escapes into the ocean from aquifers which have been intersected by cutting of the canyons. Escape of fresh water is known to occur from many nearshore areas of the sea floor of the world. Accounts of its escape from submarine canyons go back at least to Benest (1899). Johnson (1938-1939) even postulated an origin for submarine canyons on the basis of submarine erosion by escaping ground water, but his concept is now generally considered less plausible than others.

It is quite reasonable that a submarine canyon should be a local focus for escape of ground water because it is the farthest landward point of outcropping horizontal strata, and thus a point of steep pressure gradient of confined waters. The coarse sediment which floors the canyon should form no impediment. The rate of escape of the water is likely to be so low that a dilution of the overlying sea water cannot be detected. Thus, the benthic fauna may be the best indicator of escaping fresh water. At shallow depths escape is less likely, at least for Hueneme and Redondo canyons, owing to probable sea-water intrusion into aquifers produced by artificially lowered water tables of the adjacent land.

TABLE 1

CHARACTERISTICS OF WATER IN SUBMARINE CANYONS

HUENEME CANYON 23 December 1959

| Station | | 6813 | 6814 | | 6813 | 6814 |
|---|---|---|---|---|---|---|
| Distance (km) | | 1.8* | 8.6 | | 1.8 | 8.6 |
| Bottom (m) | | 234 | 439 | | 234 | 439 |
| Above axis (m) | | 0 | 0 | | 0 | 0 |
| | | Temperature (°C) | | | Silicate (μg-A/L) | |
| Depth (m) | 222 | 8.26 | — | 222 | 33 | — |
| | 420 | | 7.13 | 420 | | 38 |
| | | Salinity (‰) | | | Phosphate (μg-A/L) | |
| Depth (m) | 222 | 34.09 | — | 222 | 2.3 | — |
| | 420 | | 34.25 | 420 | | 2.7 |
| | | Oxygen (ml/L) | | | | |
| Depth (m) | 222 | 1.59 | — | | | |
| | 420 | | 0.74 | | | |

*Distance from 100-m contour.

MUGU CANYON 12 March 1960

| Station | 6906 | 6907 | 6908 | | 6906 | 6907 | 6908 |
|---|---|---|---|---|---|---|---|
| Distance (km) | 0.0 | 1.9 | 4.4 | | 0.0 | 1.9 | 4.4 |
| Bottom (m) | 116 | 369 | 484 | | 116 | 369 | 484 |
| Above axis (m) | 0 | 0 | 0 | | 0 | 0 | 0 |
| | | Temperature (°C) | | | | Silicate (µg-A/L) | |
| Depth (m) 0 | 14.0 | 14.2 | 14.6 | 0 | 7 | 5 | 6 |
| 101 | 9.62 | 9.21 | 9.45 | 101 | 45 | 51 | 45 |
| 183 | | 8.50 | 8.58 | 183 | | 63 | 62 |
| 353 | | 7.70 | 7.23 | 353 | | 81 | 96 |
| 469 | | | 6.71 | 469 | | | 114 |
| | | Salinity (‰) | | | | Phosphate (µg-A/L) | |
| Depth (m) 0 | 33.57 | 33.55 | 33.46 | 0 | 0.6 | 0.5 | 0.5 |
| 101 | 33.86 | 33.97 | 33.89 | 101 | 2.1 | 2.2 | 2.1 |
| 183 | | 34.09 | 34.09 | 183 | | 2.6 | 2.3 |
| 353 | | 34.20 | 34.23 | 353 | | 2.7 | 2.8 |
| 469 | | | 34.31 | 469 | | | 2.9 |
| | | Oxygen (ml/L) | | | | Nitrate (µg-A/L) | |
| Depth (m) 0 | — | — | — | 0 | 0.2 | — | 0.1 |
| 101 | 2.72 | 2.05 | 1.51 | 101 | 13 | 15 | 13 |
| 183 | | — | 1.01 | 183 | | 17 | 15 |
| 353 | | 1.06 | 0.54 | 353 | | 18 | 20 |
| 469 | | | 0.52 | 469 | | | 20 |

## Dume Canyon 10 March 1960

| Station | 6893 | 6894 | 6895 | | 6893 | 6894 | 6895 |
|---|---|---|---|---|---|---|---|
| Distance (km) | 0.2 | 1.5 | 3.7 | | 0.2 | 1.5 | 3.7 |
| Bottom (m) | 220 | 387 | 558 | | 220 | 387 | 558 |
| Above axis (m) | 20 | 65 | 0 | | 20 | 65 | 0 |
| | | Temperature (°C) | | | | Silicate (μg-A/L) | |
| Depth (m) 0 | 14.8 | 14.7 | 14.4 | 0 | 2 | 2 | 4 |
| 91 | 10.13 | 10.06 | 10.09 | 91 | 35 | 35 | 32 |
| 204 | 8.46 | 8.46 | 8.56 | 204 | 64 | 64 | 61 |
| 372 | | 7.25 | 7.40 | 372 | | 87 | 86 |
| 539 | | | 5.96 | 539 | | | 129 |
| | | Salinity (‰) | | | | Phosphate (μg-A/L) | |
| Depth (m) 0 | 33.57 | 33.57 | 33.53 | 0 | 0.2 | 0.3 | 0.2 |
| 91 | 33.77 | 33.69 | 33.73 | 91 | 1.5 | 1.5 | 1.5 |
| 204 | 34.13 | 34.11 | 34.07 | 204 | 2.3 | 2.0 | 2.2 |
| 372 | | 34.20 | 34.23 | 372 | | 2.6 | 2.6 |
| 539 | | | 34.34 | 539 | | | 2.8 |
| | | Oxygen (ml/L) | | | | Nitrate (μg-A/L) | |
| Depth (m) 0 | — | — | — | 0 | 0.1 | 0.1 | 0.2 |
| 91 | 3.11 | 3.11 | 3.16 | 91 | $<0.1$ | 0.1 | 9 |
| 204 | 1.60 | 1.59 | 1.71 | 204 | $<0.1$ | $<0.1$ | 17 |
| 372 | | 0.89 | — | 372 | | 19 | 17 |
| 539 | | | 0.28 | 539 | | | 20 |

## Santa Monica Canyon 20 December 1959

| Station | 6782 | 6783 | 6796 | | 6782 | 6783 | 6796 |
|---|---|---|---|---|---|---|---|
| Distance (km) | 1.0 | 9.2 | 27.1 | | 1.0 | 9.2 | 27.1 |
| Bottom (m) | 204 | 458 | 890 | | 204 | 458 | 890 |
| Above axis (m) | 0 | 0 | 0 | | 0 | 0 | 0 |
| | | Temperature (°C) | | | | Silicate (μg-A/L) | |
| Depth (m) 0 | — | — | — | 0 | — | — | — |
| 192 | 9.21 | — | — | 192 | 25 | — | — |
| 447 | | 8.06 | — | 447 | | 37 | — |
| 768 | | — | 5.19 | 768 | | — | 95 |
| 864 | | 5.15 | 5.12 | 864 | | 87 | 105 |
| | | Salinity (‰) | | | | Phosphate (μg-A/L) | |
| Depth (m) 0 | — | — | — | 0 | — | — | — |
| 192 | 33.77 | — | — | 192 | 1.8 | — | — |
| 447 | | 33.98 | — | 447 | | 2.6 | — |
| 768 | | | 34.34 | 768 | | | 3.5 |
| 864 | | | | 864 | | | 3.6 |
| | | Oxygen (ml/L) | | | | | |
| Depth (m) 0 | — | — | 4.55 | | | | |
| 192 | 3.10 | — | 2.11 | | | | |
| 447 | | 1.83 | — | | | | |
| 768 | | | 0.07 | | | | |
| 864 | | | 0.04 | | | | |

REDONDO CANYON 8 June 1956

| Station | | 4276 | 4275 | 4274 | 4273 | 4272 | 4271 | 4270 | 4268 |
|---|---|---|---|---|---|---|---|---|---|
| Distance (km) | | 0.1 | 1.9 | 4.7 | 6.7 | 8.6 | 10.5 | 12.7 | 14.2 |
| Bottom (m) | | 94 | 193 | 370 | 370 | 366 | 517 | 578 | 603 |
| Above axis (m) | | 0 | 0 | 0 | 30 | 100 | 0 | 0 | 0 |
| | | | | Temperature (°C) | | | | | |
| Depth (m) | 0 | 17.7 | 17.0 | 16.9 | 16.5 | 16.4 | 17.0 | 17.4 | 16.9 |
| | 6 | 17.07 | 16.0+ | 15.88 | 16.16 | — | 15.63 | — | 16.29 |
| | 18 | 10.86 | 11.09 | 13.19 | 13.11 | 14.38 | 14.80 | 15.49 | — |
| | 30 | 10.50 | 10.45 | — | 13.12 | 12.89 | — | — | 13.8+ |
| | 76 | 9.16 | 9.15 | 9.12 | — | — | — | — | — |
| | 93 | | — | — | — | — | — | — | — |
| | 152 | | 8.22 | 8.82 | — | 9.09 | 9.10 | 9.04 | 9.05 |
| | 192 | | | — | — | — | — | — | — |
| | 229 | | | 8.21 | — | — | 8.87 | 8.79 | — |
| | 305 | | | 7.81 | 8.31 | — | 8.34 | 8.31 | 8.08 |
| | 369 | | | | | | | | |
| | | | | Salinity (‰) | | | | | |
| Depth (m) | 0 | 33.75 | 33.84 | 33.75 | 33.80 | 33.66 | 33.64 | 33.64 | 33.80 |
| | 6 | 33.78 | 33.77 | 33.75 | 33.78 | 33.62 | 33.60 | 33.66 | 33.78 |
| | 18 | 33.77 | 33.75 | 33.69 | 33.78 | 33.60 | 33.60 | 33.62 | — |
| | 30 | 33.82 | 33.82 | — | 33.77 | 33.60 | — | — | 33.71 |
| | 76 | 34.04 | 34.05 | 34.16 | — | 33.73 | 33.73 | 33.86 | — |
| | 93 | 34.09 | — | — | — | — | — | — | — |
| | 152 | | 34.36 | 34.25 | — | 34.00 | 34.02 | 34.16 | 34.22 |
| | 192 | | 34.37 | — | — | — | — | — | — |
| | 229 | | | 34.36 | — | — | 34.16 | 34.23 | — |
| | 305 | | | 34.38 | 34.29 | — | 34.29 | 34.34 | 34.38 |
| | 369 | | | 34.43 | 34.44 | — | — | — | — |
| | 517 | | | | | | 34.33 | — | — |
| | 578 | | | | | | | 34.34 | — |
| | 602 | | | | | | | | 34.51 |

REDONDO CANYON (continued)

| Station | | 4276 | 4275 | 4274 | 4273 | 4272 | 4271 | 4270 | 4268 |
|---|---|---|---|---|---|---|---|---|---|
| Distance (km) | | 0.1 | 1.9 | 4.7 | 6.7 | 8.6 | 10.5 | 12.7 | 14.2 |
| Bottom (m) | | 94 | 193 | 370 | 370 | 366 | 517 | 578 | 603 |
| Above axis (m) | | 0 | 0 | 0 | 30 | 100 | 0 | 0 | 0 |
| | | | | Oxygen (ml/L) | | | | | |
| Depth (m) | 0 | 5.61 | 6.10 | 5.44 | 5.46 | 6.07 | 5.94 | 5.95 | 5.87 |
| | 6 | 6.10 | 5.01 | 3.55 | 6.26 | 6.18 | 6.29 | 5.82 | 6.12 |
| | 18 | 3.30 | 3.57 | 3.84 | 5.43 | 6.38 | 6.42 | 6.30 | 5.25 |
| | 30 | 2.94 | 3.18 | — | 5.02 | 4.89 | — | — | — |
| | 76 | 2.14 | 2.23 | 2.28 | — | 1.53 | 2.82 | 2.70 | — |
| | 93 | 2.13 | — | — | — | — | — | — | — |
| | 152 | | 1.17 | 0.89 | — | 2.08 | 1.99 | — | 1.85 |
| | 192 | | | — | — | — | — | — | — |
| | 229 | | | 0.79 | — | — | 1.56 | 1.43 | — |
| | 305 | | | — | 0.88 | — | 1.18 | 1.19 | 0.82 |
| | 369 | | | 0.60 | 0.94 | — | — | — | — |
| | 517 | | | | | — | 0.39 | — | — |
| | 578 | | | | | — | — | 0.40 | — |
| | 602 | | | | | — | — | — | 0.33 |
| | | | | Silicate ($\mu$g-A/L) | | | | | |
| Depth (m) | 0 | 6 | 6 | 6 | 5 | 6 | 5 | 4 | 4 |
| | 6 | 6 | 5 | 7 | 4 | 5 | 5 | 4 | 4 |
| | 18 | 17 | 16 | 7 | 6 | 5 | 6 | 7 | 7 |
| | 30 | 20 | 20 | — | 9 | 9 | — | — | — |
| | 76 | 31 | 27 | 22 | — | 24 | 24 | — | 8 |
| | 93 | 30 | — | — | — | — | — | — | — |
| | 152 | | 40 | 33 | — | 31 | 31 | 26 | 31 |
| | 192 | | 35 | — | — | — | — | — | — |
| | 229 | | | 37 | — | — | 33 | 33 | — |
| | 305 | | | 39 | 32 | — | 48 | 36 | 37 |
| | 369 | | | 48 | 44 | — | — | — | — |
| | 517 | | | | | | 55 | — | — |
| | 528 | | | | | | | 58 | — |
| | 602 | | | | | | | | 68 |

REDONDO CANYON (continued)

| Station | 4276 | 4275 | 4274 | 4273 | 4272 | 4271 | 4270 | 4268 |
|---|---|---|---|---|---|---|---|---|
| Distance (km) | 0.1 | 1.9 | 4.7 | 6.7 | 8.6 | 10.5 | 12.7 | 14.2 |
| Bottom (m) | 94 | 193 | 370 | 370 | 366 | 517 | 578 | 603 |
| Above axis (m) | 0 | 0 | 0 | 30 | 100 | 0 | 0 | 0 |
| | | | Phosphate ($\mu$g-A/L) | | | | | |
| Depth (m) 0 | 0.3 | 0.3 | 0.5 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 |
| 6 | 0.4 | 0.5 | 0.2 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 |
| 18 | 1.2 | 1.8 | 0.6 | 0.7 | 0.3 | 0.5 | 0.4 | 0.5 |
| 30 | 1.9 | 2.0 | — | 0.8 | 1.0 | — | — | — |
| 76 | 2.4 | 2.4 | 1.7 | — | 2.4 | 2.3 | — | 0.7 |
| 93 | 2.1 | — | — | — | — | — | — | — |
| 152 | | 2.8 | 2.2 | — | 2.3 | 2.5 | 2.0 | 2.5 |
| 192 | | 2.5 | — | — | — | — | — | — |
| 229 | | | 2.6 | — | — | 2.6 | 2.5 | — |
| 305 | | | 2.9 | 2.8 | — | 3.2 | 2.7 | 2.7 |
| 369 | | | 2.7 | 3.5 | — | — | — | — |
| 517 | | | | | | 3.5 | — | — |
| 578 | | | | | | | 3.6 | — |
| 602 | | | | | | | | 3.6 |

SAN PEDRO SEA VALLEY 13 February 1960

| Station | 6855 | 6856 | 6857 | 6858 | | 6855 | 6856 | 6857 | 6858 |
|---|---|---|---|---|---|---|---|---|---|
| Distance (km) | 0.2 | 2.1 | 3.7 | 8.0 | | 0.2 | 2.1 | 3.7 | 8.0 |
| Bottom (m) | 187 | 404 | 549 | 682 | | 187 | 404 | 549 | 682 |
| Above axis (m) | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| | | Temperature (°C) | | | | | Silicate (µg-A/L) | | |
| Depth (m) 0 | 12.0 | 13.2 | 13.8 | 14.4 | 0 | — | 13 | 12 | 13 |
| 91 | 9.72 | 9.90 | 9.93 | 9.74 | 91 | 43 | 38 | 37 | 39 |
| 172 | 8.91 | 8.88 | 9.11 | 9.00 | 172 | 66 | 56 | 56 | 53 |
| 366 | | 7.46 | 7.55 | 7.42 | 366 | | 86 | 87 | 87 |
| 533 | | | 6.22 | 6.22 | 533 | | | 123 | 123 |
| 666 | | | | 5.34 | 666 | | | | 158 |
| | | Salinity (‰) | | | | | Phosphate (µg-A/L) | | |
| Depth (m) 0 | — | 33.49 | 33.40 | 33.37 | 0 | — | 1.3 | 1.3 | 1.1 |
| 91 | 33.71 | 33.69 | 33.75 | 33.69 | 91 | 2.0 | 2.2 | 2.0 | 2.2 |
| 172 | 33.89 | 33.96 | 33.95 | 33.95 | 172 | 2.6 | 2.6 | 2.4 | 2.6 |
| 366 | | 34.20 | 34.18 | 34.14 | 366 | | 3.2 | — | 3.1 |
| 533 | | | 34.25 | 34.27 | 533 | | | 3.5 | 2.9 |
| 666 | | | | 34.33 | 666 | | | | 3.7 |
| | | Oxygen (ml/L) | | | | | Nitrate (µg-A/L) | | |
| Depth (m) 0 | — | 5.72 | 5.88 | 5.93 | 0 | — | 4 | 4 | 3 |
| 91 | 2.94 | 3.35 | 3.07 | 3.01 | 91 | 16 | 15 | 14 | 18 |
| 172 | 2.04 | 1.92 | 2.07 | 1.88 | 172 | 18 | 20 | 18 | 16 |
| 366 | | 0.78 | 0.80 | 0.73 | 366 | | 18 | 20 | 23 |
| 533 | | | 0.30 | 0.29 | 533 | | | 22 | 21 |
| 666 | | | | 0.15 | 666 | | | | 23 |

NEWPORT CANYON 5 May 1960

| Station | 7025 | 7026 | 7027 | | 7025 | 7026 | 7027 |
|---|---|---|---|---|---|---|---|
| Distance (km) | —0.2 | 1.5 | 2.6 | | —0.2 | 1.5 | 2.6 |
| Bottom (m) | 62 | 182 | 253 | | 62 | 182 | 253 |
| Above axis (m) | 0 | 0 | 0 | | 0 | 0 | 0 |
| | | Temperature (°C) | | | | Silicate (µg-A/L) | |
| Depth (m) 0 | 17.0 | — | 16.4 | 0 | 6.9 | 5.7 | 4.7 |
| 47 | 10.22 | 10.31 | 10.23 | 47 | 39.9 | 38.2 | 35.2 |
| 166 | | 8.92 | 8.67 | 166 | | 60.4 | 61.6 |
| 238 | | | 8.28 | 238 | | | 68.8 |
| | | Salinity (‰) | | | | Phosphate (µg-A/L) | |
| Depth (m) 0 | 33.51 | 33.62 | 33.58 | 0 | 0.53 | 0.30 | 0.28 |
| 47 | 33.75 | 33.82 | 33.82 | 47 | 1.88 | 1.82 | 1.77 |
| 166 | | 33.95 | 34.07 | 166 | | 2.27 | 2.36 |
| 218 | | | 34.22 | 238 | | | 2.64 |
| | | Oxygen (ml/L) | | | | | |
| Depth (m) 0 | — | — | — | | | | |
| 47 | 2.71 | 2.92 | 2.81 | | | | |
| 166 | | 2.40 | 1.57 | | | | |
| 238 | | | 1.07 | | | | |

LA JOLLA CANYON 6 May 1960

| Station | 7033 | 7034* | 7035 | 7036 | | 7033 | 7034 | 7035 | 7036 |
|---|---|---|---|---|---|---|---|---|---|
| Distance (km) | 0.2 | 0.3 | 1.4 | 4.2 | | 0.2 | 0.3 | 1.4 | 4.2 |
| Bottom (m) | 102 | 163 | 250 | 369 | | 102 | 163 | 250 | 369 |
| Above axis (m) | 2 | 0 | 9 | 7 | | 2 | 0 | 9 | 7 |
| | | Temperature (°C) | | | | | Silicate (μg-A/L) | | |
| Depth (m) 0 | 16.2 | 16.2 | 16.8 | 16.8 | 0 | 10.9 | 10.8 | 11.8 | 12.5 |
| 87 | 9.60 | — | 9.30 | 9.42 | 87 | 49.0 | — | 54.9 | 51.8 |
| 148 | | 8.95 | — | 8.97 | 148 | | 64.7 | — | 61.9 |
| 235 | | | 8.25 | 8.14 | 235 | | | 75.9 | 75.9 |
| 359 | | | | 7.53 | 359 | | | | 84.4 |
| | | Salinity (‰) | | | | | Phosphate (μg-A/L) | | |
| Depth (m) 0 | 33.62 | 33.62 | 33.64 | 33.66 | 0 | 0.38 | 0.46 | 0.28 | 0.36 |
| 87 | 33.93 | — | 34.02 | 33.98 | 87 | 2.05 | — | 2.13 | 2.13 |
| 148 | | 34.11 | — | 34.14 | 148 | | 2.39 | — | 2.39 |
| 235 | | | 34.22 | 34.23 | 235 | | | 2.64 | 2.55 |
| 359 | | | | 34.29 | 359 | | | | 2.76 |
| | | Oxygen (ml/L) | | | | | | | |
| Depth (m) 0 | — | — | — | — | | | | | |
| 87 | 2.54 | — | 2.16 | 2.64 | | | | | |
| 148 | | 1.67 | — | 1.51 | | | | | |
| 235 | | | 1.12 | 1.18 | | | | | |
| 359 | | | | 0.76 | | | | | |

*Scripps Branch

CORONADO CANYON 1 February 1960

| Station | | 6847 | 6848 | 6843 | | 6847 | 6848 | 6843 |
|---|---|---|---|---|---|---|---|---|
| Distance (km) | | 0.8 | 4.1 | 21.8 | | 0.8 | 4.1 | 21.8 |
| Bottom (m) | | 174 | 356 | 1203 | | 174 | 356 | 1203 |
| Above axis (m) | | 0 | 0 | 0 | | 0 | 0 | 0 |
| | | Temperature (°C) | | | | Silicate (μg-A/L) | | |
| Depth (m) | 0 | 14.5 | — | — | 0 | 5.2 | 5.7 | 0.7 |
| | 91 | 10.16 | 10.09 | — | 91 | 35.6 | 36.8 | 24.3 |
| | 152 | 9.25 | 9.12 | — | 152 | 52.8 | 52.7 | — |
| | 183 | | — | 9.33 | 183 | | 58.0 | 51.4 |
| | 341 | | 7.78 | 7.73 | 341 | | 79.6 | 80.8 |
| | 549 | | | 6.12 | 549 | | | 104.5 |
| | 1187 | | | 3.62 | 1187 | | | 197.3 |
| | | Salinity (‰) | | | | Phosphate (μg-A/L) | | |
| Depth (m) | 0 | 33.58 | 33.58 | 33.49 | 0 | 0.7 | 0.7 | 0.7 |
| | 91 | 33.75 | 33.77 | 33.62 | 91 | 2.2 | 2.0 | 1.7 |
| | 152 | 33.96 | 33.95 | — | 152 | 2.7 | 2.5 | — |
| | 183 | | 34.04 | 34.00 | 183 | | 2.6 | 2.3 |
| | 341 | | 34.16 | 34.19 | 341 | | 3.0 | 3.1 |
| | 529 | | | 34.25 | 529 | | | 3.6 |
| | 1187 | | | 34.54 | 1187 | | | 3.5 |
| | | Oxygen (ml/L) | | | | Nitrate (μg-A/L) | | |
| Depth (m) | 0 | 5.91 | 5.76 | 5.84 | 0 | 2.5 | 2.1 | 2.8 |
| | 91 | 3.60 | 3.59 | — | 91 | 13.3 | 16.6 | 10.4 |
| | 152 | 2.53 | 1.88 | — | 152 | 16.3 | 18.9 | — |
| | 183 | | 1.62 | 2.48 | 183 | | 20.3 | 17.9 |
| | 341 | | 0.88 | 1.13 | 341 | | 20.8 | 22.1 |
| | 529 | | | 0.31 | 529 | | | 21.8 |
| | 1187 | | | 0.68 | 1187 | | | 25.5 |

SANTA CRUZ CANYON 22 December 1959

| Station | | 6802 | 6807 | | 6802 | 6807 |
|---|---|---|---|---|---|---|
| Distance (km) | | 3.7 | 14.2 | | 3.7 | 14.2 |
| Bottom (m) | | 220 | 581 | | 220 | 581 |
| Above axis (m) | | 0 | 5 | | 0 | 5 |
| | | Temperature (°C) | | | Silicate (μg-A/L) | |
| Depth (m) | 208 | 9.65 | — | 208 | 26 | — |
| | 531 | | 5.90 | 531 | | 97 |
| | | Salinity (‰) | | | Phosphate (μg-A/L) | |
| Depth (m) | 208 | 33.78 | — | 208 | 1.9 | — |
| | 531 | | 34.20 | 531 | | 2.9 |
| | | Oxygen (ml/L) | | | | |
| Depth (m) | 208 | 2.70 | — | | | |
| | 531 | | 0.28 | | | |

## SANTA CATALINA CANYON 28 June 1960

| Station | 6824 | 6825 | 6826 | 6827 | | 6824 | 6825 | 6826 | 6827 |
|---|---|---|---|---|---|---|---|---|---|
| Distance (km) | 0.4 | 2.6 | 7.4 | 16.1 | | 0.4 | 2.6 | 7.4 | 16.1 |
| Bottom (m) | 206 | 363 | 716 | 1245 | | 206 | 363 | 716 | 1245 |
| Above axis (m) | 5 | 0 | 0 | 90 | | 5 | 0 | 0 | 90 |
| | Temperature (°C) | | | | | Silicate (μg-A/L) | | | |
| Depth (m) 0 | — | 14.8 | 14.9 | 15.0 | 0 | — | — | — | — |
| 88 | 11.54 | — | — | — | 88 | 22 | — | 19 | 19 |
| 192 | 9.01 | — | 9.09 | 9.22 | 192 | 53 | — | 52 | 51 |
| 347 | | 7.60 | 7.59 | 7.50 | 347 | | 86 | 40 | 83 |
| 701 | | | 6.53 | 5.17 | 701 | | | 117 | 164 |
| 1230 | | | | 4.06 | 1230 | | | | 208 |
| | Salinity (‰) | | | | | Phosphate (μg-A/L) | | | |
| Depth (m) 0 | — | — | — | — | 0 | — | — | — | — |
| 88 | 33.58 | — | 33.58 | 33.58 | 88 | 1.3 | — | 1.3 | 1.3 |
| 192 | 33.95 | — | 34.00 | 33.92 | 192 | 2.4 | — | 2.3 | 2.3 |
| 347 | | 34.22 | 34.22 | 34.22 | 347 | | 3.1 | 2.9 | 3.1 |
| 701 | | | 34.29 | 34.40 | 701 | | | 3.3 | 3.3 |
| 1230 | | | | 34.52 | 1230 | | | | 3.5 |
| | Oxygen (ml/L) | | | | | Nitrate (μg-A/L) | | | |
| Depth (m) 0 | — | — | — | — | 0 | — | — | — | — |
| 88 | 4.14 | — | 4.26 | 4.20 | 88 | 10.5 | — | 17.6 | 16.8 |
| 192 | 2.60 | — | 2.24 | 2.38 | 192 | 17.9 | — | 24.4 | 25.2 |
| 347 | | 1.07 | 0.93 | 0.73 | 347 | | 24.6 | 27.9 | 26.4 |
| 701 | | | 0.53 | 0.55 | 701 | | | 26.4 | 28.1 |
| 1230 | | | | 0.26 | 1230 | | | | 35.5 |

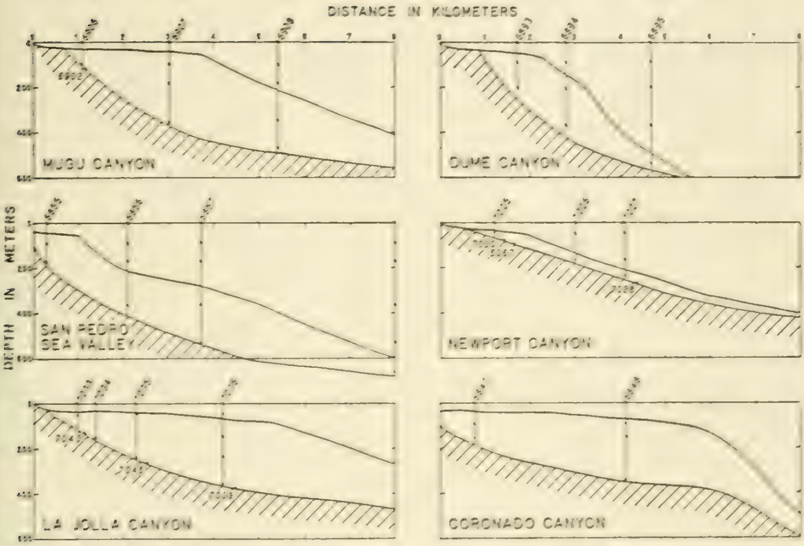



Fig. 18.—Positions and depths of water samples in six canyons at stations shown by open circles in Figures 3 through 15. The solid dots and italicized station numbers along the canyon axes indicate samples having abundant specimens of the polychaete worm *Capitella*.

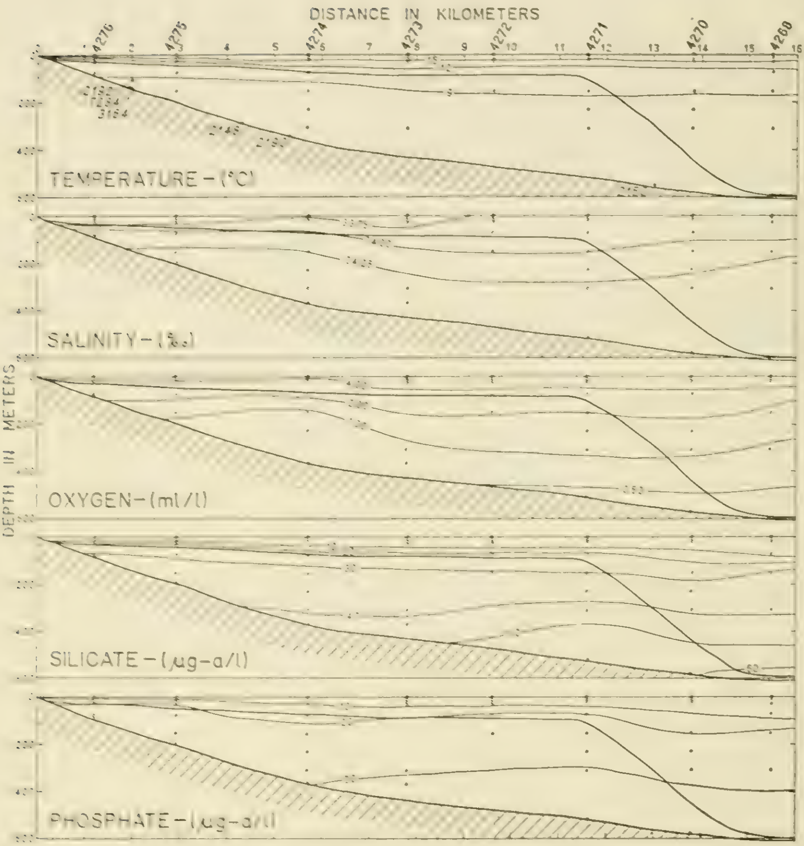



Fig. 19.—Characteristics of water in Redondo Canyon. Symbols same as for Figure 18.

TABLE 2

CAPITELLA BOTTOMS IN CANYONS
(from Hartman, 1962)

| Canyon | Sample Number | Depth (m) | Number of Specimens* |
|---|---|---|---|
| Hueneme | 6897 | 338 | 1 |
| | 6899 | 456 | 52 |
| Mugu | 6902 | 119 | 9 |
| Santa Monica | 6781 | 116 | 9200+ |
| | 6780 | 183 | 55 |
| Redondo | 2192 | 113 | 1 |
| | 7284 | 137 | 1 |
| | 3164 | 148 | 17 |
| | 2148 | 298 | 27 |
| | 2190 | 344 | 133 |
| | 2150 | 575 | 1 |
| Newport | 7030 | 85 | 2 |
| | 5367 | 97 | 2 |
| | 7730 | 235 | 7 |
| | 7028 | 272 | 1 |
| La Jolla | 7043 | 135 | 595 |
| | 7045 | 274 | 14145 |
| | 7039 | 371 | 948 |
| | 7046 | 517 | 36 |
| | 7041 | 545 | 1 |
| | 7040 | 637 | 3 |
| | 7047 | 793 | 5 |

*Sampler covers an area of 0.6 square meters of ocean floor.

## SEDIMENTS

### Sampling Methods

This study is based entirely upon surface samples, though cores were used in some previous work by Gorsline and Emery (1959) in a few submarine canyons. More than 90 per cent of the samples were taken with a large clam-shell bucket which covers an area of 0.6 square meter and encloses as much as 0.18 cubic meter of mud; these samples were taken primarily for the biological work to be described by Hartman. Most are the result of attempts to sample the axes of the canyons using the same procedure as that for positioning water-sampling stations. Because of ship drift, however, some of the attempts missed the axes and these samples are from the steep side slopes of the canyons. About 10 per cent of the samples were obtained with a small snapper having a volume of about 500 cc. Some snapper samples are from water-sampling stations, but others are independent samples designed to learn the nature of sediments on the walls of the canyons. Of a total of 211 samples,

some kind of sediment analysis was made for 176. In 16 samples two different kinds of sediment were noted; these were separated and analyzed individually.

## Texture

Textural analyses were made by a combination of standard pipette procedure for fine ($<$ 62 micron) fractions and settling tube for the coarse fractions. Percentages of gravel, sand, silt, and clay are reported in the Appendix, along with median diameter and Trask sorting coefficient. The Trask coefficient was used so that results would be comparable with those of the many other analyses of sediments in the region (Emery, 1960a).

A comparison of the median diameters of samples from within 10 meters of the floor of the canyons with those of samples from higher on the walls is given in the top panel of Figure 20. The frequency curves show that the sediment from the axes is only slightly coarser than that from the walls. Clean coarse, even gravelly, sediment is present in many samples from the canyon floors, but other coarse sediment occurs high on the canyon walls and atop the adjacent shelf. Fine green silty clay is common on the canyon walls but it also is interbedded with clean sands along the canyon axes. The average median diameter of the 95 axial samples is 69 microns and for the 60 wall samples it is 40 microns. A similar average median diameter of 70 microns was obtained by Cohee (1938) for 29 small dredge samples mostly from the walls of Hueneme, Mugu, Dume, Newport, and Coronado canyons.

The sorting coefficients for axial and wall samples exhibit even smaller differences than do median diameters, so no distinction was made on most panels of Figure 20 for the two sources of sediments. Sorting coefficients for all canyon sediments average about 2.5 but in a general way the sorting coefficients are lower for sediments having median diameters coarser than 50 microns than for finer sediments: about 1.8 versus 3.2.

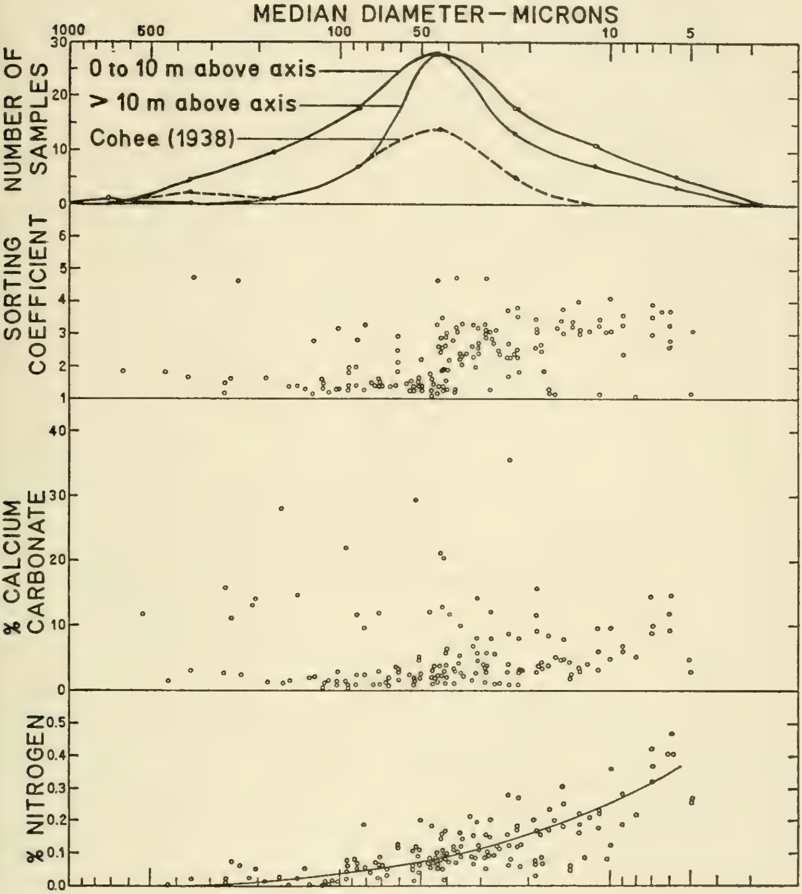



Fig. 20.—Relationship of median diameters of samples from submarine canyons to frequency of occurrence, sorting coefficient, and contents of calcium carbonate and Kjeldahl nitrogen.

## Calcium Carbonate

Dried and weighed sediment samples were treated with sulphuric acid, heated, and the evolved carbon dioxide was measured volumetrically. From these volumes the percentages of calcium carbonate were computed on the assumption that all of the carbonate was combined with calcium.

The results (Fig. 20) exhibit a range from 0 to 36 per cent calcium carbonate. Nearly all values lower than 10 per cent are from canyons along the mainland. Most values higher than 10 per cent are from the offshore Santa Cruz, San Clemente, and Tanner canyons. As a secondary trend, the higher percentages for nearshore canyons occur in the finer-grained samples, and for the offshore canyons they are in the coarser-grained samples. Calcium carbonate grains coarse enough to be identified as to source organism consist dominantly of shell fragments in the coarse sediments and of foraminiferal tests in the fine sediments.

## Organic Matter

The content of organic matter in the sediment samples was measured as nitrogen using micro-Kjeldahl equipment and as carbon using a Leco (Laboratory Equipment Company) carbon analyzer. The latter device measures the carbon dioxide evolved by fusing the sample at 1300° C in an induction furnace. Kjeldahl nitrogen would serve as an excellent measure of total organic matter except that nitrogen constitutes only about 6 per cent of total organic matter and it is more subject to oxidation than is carbon, as indicated by an increase of C/N ratio with depth of sediment burial or lapsed time (Emery, 1960a). Carbon comprises about 55 per cent of total organic matter but it is very difficult to measure satisfactorily, owing to the difficulty of combusting some carbonaceous materials and to the variable ease by which carbon is released from calcium carbonate. As a result, organic carbon in samples was measured in two different ways: by combusting the residue left from carbonate analysis (direct method), and by combusting a total sample and subtracting carbonate carbon (difference method). The direct method may yield results that are too low owing to partial breakdown of organic matter by the acid treatment for carbonate, or too high because of incomplete breakdown of carbonate carbon by the acid. The second method can yield erratic results because of the need for two separate subsamples.

In general, the results by the two methods of carbon analysis agree (Fig. 21), but there are some individual variations and the direct method is considered the more reliable. A plot of direct organic carbon against Kjeldahl nitrogen (Fig. 22) reveals good agreement for about 95 per

cent of the samples. A best-fit straight line through the plotted values for these samples yields an average C/N ratio of 8.9, nearly the same as the average for the surface sediments of the basins (Emery, 1960a, p. 276).

When plotted against median diameter, the nitrogen (Fig. 20) as well as the organic carbon exhibits a close relationship. Percentages of nitrogen decrease from an average of about 0.4 per cent for sediments of 5 microns median diameter to less than 0.05 per cent for sediments of median diameter coarser than 100 microns. This relationship to grain size is typical and it results from the similarity in settling velocity of organic matter and of fine-grained silts or clays and from adsorption of organic matter on clay minerals. Average total organic matter is 2.16 per cent when computed from organic carbon (1.7 times the average of 1.27 per cent organic carbon) and 1.87 per cent when computed from nitrogen (17 times the average of 0.11 per cent nitrogen). Perhaps the best figure for average total organic matter is the average of the two values, or 2.0 per cent.

## Comparison with Sediments of Adjacent Areas

Sediments of the canyons reveal differences which depend upon the degree of isolation from sources of detrital material. These differences are best illustrated by a comparison of sediments from canyons cutting the mainland shelf, the island shelves, and the bank tops (Table 3). Most pronounced is an increase in average percentage of calcium carbonate from mainland canyons to island canyons to bank canyons. The average median diameter exhibits little change, except for an increase in Tanner Canyon, the only one off a bank. Percentage of organic matter increases from mainland to island canyons probably because the slower rate of deposition of similar average grain sizes of detrital sediment in the latter permits less dilution of organic matter.

When compared with sediments of the source areas (mainland shelf, island shelves, and bank tops) and with those of the sites of final deposition (basin floors), the sediments of the canyons are found to be intermediate in nearly all the averages (Table 3). Sediments of the canyons are finer grained than those of the shelves and coarser than those of the basin floors. Sorting coefficients are also intermediate, except at Tanner Canyon where only six samples are available, most of which are coarse grained. The average content of calcium carbonate also is intermediate between values for shelf and basin sediments except for the mainland canyons, which have a very low content for some unknown reason. Average contents of organic matter are intermediate in all instances. These

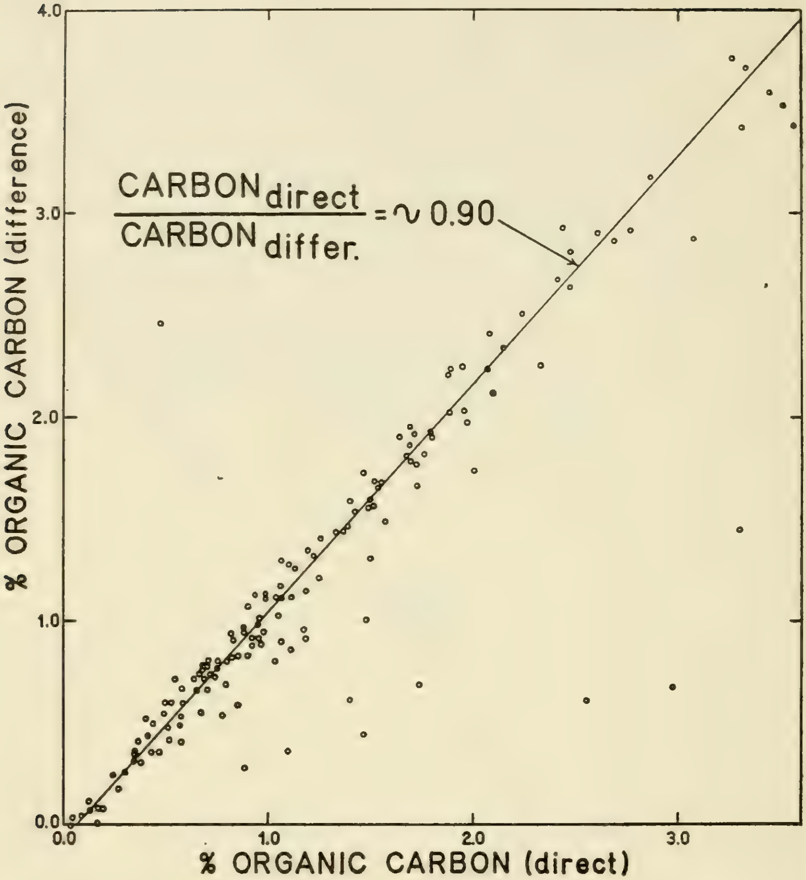



Fig. 21—Results of separate determinations for organic carbon on sub-samples, based on (1) analysis for carbon in residue from carbonate analysis, and (2) on analysis for total carbon minus carbonate carbon.

generally intermediate characteristics of the sediments in canyons with respect to sediments of shelves and basins are reasonable in view of other lines of evidence which indicate that the canyons serve as the routes through which at least the coarser sediments reach the basins for permanent deposition. However, the averages of Table 3 do not reveal whether the movement through the canyons is chiefly by rapid turbidity currents or by slow creep.

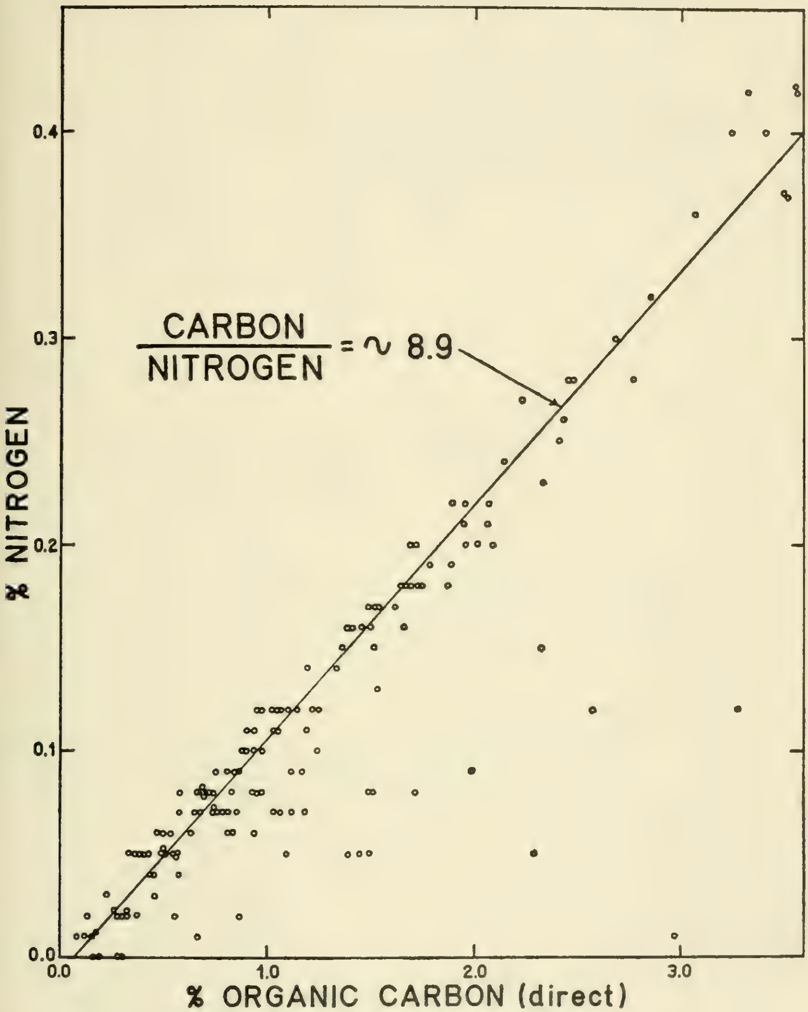



Fig. 22.—Comparison of carbon and nitrogen analyses on samples from submarine canyons.

## TABLE 3

### Sediments of Submarine Canyons and Other Environments[1]

| | Median Dia. ($\mu$) | Sorting Coefficient (Trask) | $CaCO_3$ (%) | Organic C (%) | Nitrogen (Kjeldahl) (%) | Organic Matter (%) |
|---|---|---|---|---|---|---|
| Mainland Shelf | 130 (1773)[8] | 1.6 (804) | 9.2 (591) | — | — | 0.9 (273) |
| Mainland Canyons[2] | 65 (144) | 2.4 (143) | 3.8 (138) | 1.11 (118) | 0.11 (133) | 1.9[9] (133) |
| Nearshore Basins[3] | 6.5 (326) | 3.7 (180) | 10.3 (132) | — | 0.37 (39) | 6.3 (39) |
| Island Shelves | 260 (298) | 1.7 (290) | 27 (256) | — | — | 0.6 (168) |
| Island Canyons[4] | 62 (19)[10] | 3.0 (20) | 12.3 (26) | 1.75 (28) | 0.14 (28) | 2.7 (2.8) |
| Moderate Offshore Basins[5] | 4.0 (117) | 3.8 (113) | 12.0 (139) | — | 0.45 (23) | 7.6 (23) |
| Bank Tops | 270 (284) | 2.3 (164) | 56 (166) | — | — | 0.8 (146) |
| Bank Canyons[6] | 98 (6) | 1.9 (6) | 23.7 (6) | 2.09 (6) | 0.07 (6) | 2.4 (6) |
| Offshore Basins[7] | 4.0 (50) | 3.1 (48) | 21.5 (66) | — | 0.38 (8) | 6.4 (8) |

[1]Non-canyon data from Emery (1960a, pp. 181, 220).

[2]Hueneme, Mugu, Dume, Santa Monica, Redondo, Newport, La Jolla, Coronado.

[3]Santa Barbara, Santa Monica, San Pedro, San Diego.

[4]Santa Cruz, Santa Catalina, San Clemente.

[5]Santa Cruz, Santa Catalina, San Clemente.

[6]Tanner.

[7]San Nicolas, East Cortes, No Name.

[8]Number in parentheses is number of samples.

[9]Organic matter for canyons = average of 1.7 X organic carbon and 17 X nitrogen.

[10]Omitting station 6809 from Santa Cruz Canyon—exceptionally coarse.

## SUMMARY AND CONCLUSIONS

In many ways submarine canyons are intermediate between shelves and basin floors. Their axial slopes are intermediate in steepness; thus the canyons not only dissect the basin slopes but their heads extend landward of the shelf break. Where the heads of the canyons are very close to shore they may serve as local sites for upwelling in response to the action of wind in driving surface water toward the open sea. This upwelling, however, appears to be weak and probably discontinuous. It does not establish a very unique ecological environment, but the minor differences in the waters of canyons or basins which do exist may possibly be significant for some animals.

Canyons which cross much of the width of shelves and of basin slopes receive sediments in at least three different ways. Most important quantitatively is grain-by-grain deposition of silts and clays carried in suspension from the mouths of streams and from the turbulent shore zone. When deposited, this sediment forms a homogeneous blanket of green mud on the steep walls of the canyons as well as on the basin slopes and floors farther seaward. The steepness of the canyon walls, possibly aided by animal activities, allows the sediment to move downslope to the canyon axes. This movement not only exposes rock outcrops on the sides of the canyons but also produces interbeds of the green mud with coarser sediment on the canyon floors. Whether the mud moves downslope slowly and continuously or rapidly and intermittently is unknown. The outer parts of the canyons, the channels on the basin floors, also receive the grain-by-grain deposits, but because of the gentle slopes of the sub-sea aprons there probably is little mass movement of this sediment.

Second most important, but probably of greatest interest, is the deposition of sand and fine gravels which move down coast along beaches and atop the inner part of the shelves, under the influence of longshore currents. These currents are partly the inshore portions of the general southern California eddy but mostly they are produced by the diagonal approach to shore of the dominant waves from the northwest (Emery, 1960a). Where canyons extend close in to shore, they serve as traps for this moving sediment. The sediment may accumulate slowly until it finally moves out en mass, causing a sudden deepening of the water of the canyon head (Shepard, 1951a, and other papers). The moving mass may become transformed into a turbidity current which carries sand into deep water (Shepard, 1951b), building up sub-sea fans or aprons at the mouths of the canyons (Gorsline and Emery, 1959; Emery, 1960b). These sands have the same general grain size as the nearshore sediments

of the shelves and they contain shallow-water foraminifera and remains of other animals and plants, including bits of wood from land. Within the canyons the sands form narrow bands traversing the canyon axes between the steep walls covered by green mud. Movement of this mud downslope to the intermittently moving axial sand produces the observed bedded character of the sediment on the floors of the canyons. The sands in canyons near the mainland contain lower percentages of calcium carbonate than do the muds, in agreement with the low content of calcium carbonate in sands atop the mainland shelves as compared with that of muds on the basin slopes and floors. In contrast, the sands in offshore canyons have more calcium carbonate than the muds, again in response to the shelly nature of sands of island shelves and bank tops.

Third, and least important, are small quantities of sediment from the outer parts of the shelves which are moved into the canyons, probably by occasional storm waves. Their presence is attested by occasional grains of glauconite and phosphorite, authigenic sediments which are most common on bank tops and on the outer parts of shelves.

As shown by Menard (1955) and by Emery (1960a), the quantities of sediment in sub-sea fans and aprons far exceed the volume of rock which has been removed during erosion of the canyons. Since the fans consist mostly of sand, it is evident that the canyons act as conduits for movement of sand from near shore to deep water. As pointed out by others, this movement may act as a sort of giant chain saw cutting downward into the bedrock floors of the canyons. Deepening of the axes steepens the side walls and allows more sliding of muds from the canyon walls, possibly leading to lateral enlargement of the canyons. Future work from manned or televised deep-diving vehicles should go far toward investigating this interesting geological agent of erosion.

Downcutting of canyon axes by moving axial sands should clear away a strip through the blanketing muds or prevent the muds from being deposited. Any aquifer which has been exposed through erosion by the same sand or by other possible canyon-forming agents is thereby exposed to the sea water. If the internal water pressure is greater than hydrostatic pressure of sea water at the outcrop, fresh water should leak to the sea. If the reverse is true, owing to over-pumping or perhaps to natural causes, sea-water intrusion should occur. Because of widespread over-pumping in the intensely cultivated and highly populated coastal areas of southern California, sea-water intrusion is well known. It is generally made manifest by increasing salinity of water wells (Emery, 1960a). Deeper aquifers, largely untapped by water wells, may be expected to behave differently than the over-pumped shallow ones.

Accordingly, it should occasion no great surprise to learn that the deep aquifers still discharge fresh water, as did the shallow ones during the nineteenth century. The quantity of discharge must be small compared with the volume of sea water within the canyons. Accordingly, one should not expect to detect it through water analyses, except perhaps of interstitial waters of axial sands or by visual inspection from deep-diving vehicles. The finding of fresh-water worms and the absence of marine animals in more than a score of axial sediment samples serves as a clear indication of seaward loss of water from deep aquifers. Probably most of the loss of fresh water from these aquifers occurs through the canyons because they represent the points of outcrop of aquifers nearest land and thus are the focal points of the steepest pressure gradients.

## LITERATURE CITED


Benest, H.
1899. Submarine gullies, river outlets, and fresh-water escapes beneath the sea-level. Geogr. Jour., 14:394-413.

Buffington, E. C.
1951. Gullied submarine slopes off southern California (Abstr.). Geol. Soc. America, Bull., 62:1497.
1952. Submarine "natural levees." Jour. Geol., 60:473-479.
*in press.* Geophysical evidence on the origin of gullied submarine slopes, San Clemente, California. Jour. Geol.

Cohee, G. V.
1938. Sediments of the submarine canyons off the California coast. Jour. Sediment. Petrol., 8:19-33.

Emery, K. O.
1954. Source of water in basins off southern California. Jour. Mar. Res., 13:1-21.
1960a. The sea off southern California: a modern habitat of petroleum. 366p. Wiley, New York.
1960b. Basin plains and aprons off southern California. Jour. Geol., 68:464-479.

Emery, K. O., and F. P. Shepard
1945. Lithology of the sea floor off southern California. Geol. Soc. America, Bull., 56:431-477.

Emery, K.O., and R. D. Terry
1956. A submarine slope of southern California. Jour. Geol., 64:271-280.

Gorsline, D. S., and K. O. Emery
1959. Turbidity-current deposits in San Pedro and Santa Monica basins off southern California. Geol. Soc. America, Bull., 70:270-290.

Hartman, Olga
1962. A new monstrillid copepod parasitic in capitellid polychaetes in southern California. Zool. Anz., 167:325-334.

Johnson, D. W.
1938-39. Origin of submarine canyons. Jour. Geomorphol., 1:111-129, 230-243, 324-340; 2:42-60, 133-158, 213-236.

Luskin, B., B. C. Heezen, M. Ewing, and M. Landisman
1954. Precision measurement of ocean depth. Deep-sea Res., 1:131-140.

Menard, H. W.
1955. Deep-sea channels, topography, and sedimentation. Amer. Assoc. Petrol. Geologists, Bull., 39:236-255.

Northrop, John
1953. A bathymetric profile across the Hudson Submarine Canyon and its tributaries. Jour. Mar. Res., 12:223-232.

Rittenberg, S. C., K. O. Emery, and W. L. Orr
1955. Regeneration of nutrients in sediments of marine basins. Deep-sea Res., 3:23-45.

Shepard, F. P.
1951a. Mass movements in submarine canyon heads. Amer. Geophys. Union, Trans., 32:405-418.
1951b. Transportation of sand into deep water. Soc. Econ. Paleontologists and Mineralogists, Spec. Pub., 2:53-64.

Shepard, F. P., and C. N. Beard
1938. Submarine canyons: Distribution and longitudinal profiles. Geogr. Rev., 28:439-451.

Shepard, F. P., and K. O. Emery
1941. Submarine topography off the California coast: Canyons and tectonic interpretations. Geol. Soc. America, Spec. Pap. 31, 171p.

Shepard, F. P., R. Revelle, and R. S. Dietz
1939. Ocean bottom currents off the California coast. Science, 89:488-489.

APPENDICES

## Hueneme Canyon

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand (>62μ) | % Silt (62–4μ) | % Clay (<4μ) | Sorting coefficient [Trask] | $CaCO_3$ % | Organic C (direct) % | N (Kjeldahl) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4846 | 34°07′15″ | 119°13′45″ | 309 | 0 | .031 | 9 | 63 | 28 | 3.2 | 4.1 | | .10 |
| 5114 | 08′00″ | 13′20″ | 165 | 20 | .128 | 89 | 9 | 2 | 1.2 | 2.2 | | .01 |
| 5115 | 05′30″ | 14′10″ | 373 | 0 | | | | | | 5.7 | | .03 |
| 5531 | 08′00″ | 13′15″ | 178 | 7 | | | | | | 5.2 | | .06 |
| 5532 | 05′25″ | 14′10″ | 376 | 0 | 0.032 | 16 | 72 | 12 | 2.0 | 2.6 | | .07 |
| 5686 | 05′35″ | 14′10″ | 374 | 0 | | | | | | 1.7 | | .02 |
| 5688 | 08′00″ | 13′18″ | 183 | 0 | | | | | | 4.4 | | .07 |
| 6814 | 03′55″ | 14′44″ | 439 | 0 | .019 | 11 | 67 | 22 | 2.6 | 3.0 | .76 | .07 |
| 6896 | 07′18″ | 13′43″ | 271 | 16 | .051 | 45 | 42 | 13 | 2.2 | 2.0 | .46 | .03 |
| 6897 | 06′14″ | 13′44″ | 338 | 9 | .095 | 65 | 31 | 4 | 1.8 | 1.6 | .30 | .02 |
| 6898 | 05′00″ | 13′55″ | 373 | 46 | .018 | 5 | 74 | 21 | 2.6 | 3.3 | .83 | .08 |
| 6899 | 03′55″ | 14′28″ | 456 | 9 | .165 | 36/52* | 10 | 2 | 15.1 | 1.0 | .34 | .02 |
| 6900 | 03′00″ | 14′28″ | 473 | 11 | .022 | 11 | 70 | 19 | 2.5 | 2.5 | .64 | .06 |
| 6901 | 01′00″ | 15′00″ | 621 | 2 | .154 | 90 | 8 | 2 | 1.4 | 1.6 | .17 | .00 |
| 6905 | 08′30″ | 13′00″ | 98 | 0 | .116 | 86 | 14 | 0 | 1.5 | 1.3 | .08 | .01 |

*36/52 = gravel/sand

## Mugu Canyon

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand ($>62\mu$) | % Silt ($62$–$4\mu$) | % Clay ($<4\mu$) | Sorting coefficient [Trask] | $CaCO_3$ % | Organic C (direct) % | N (Kjeldahl) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4851 | 34°03′30″ | 119°05′55″ | 171 | 325 | .042 | 41 | 43 | 16 | 1.6 | 2.3 | | .08 |
| 4852 | 05′14″ | 05′45″ | 15 | 105 | .110 | 94 | 3 | 3 | 1.3 | 1.8 | | .01 |
| 6902 | 05′20″ | 05′22″ | 119 | 0 | 1.986 | 29/53 | 12 | 6 | 4.1 | 1.9 | .26 | .02 |
| 6903 | 04′42″ | 06′12″ | 352 | 0 | .029 | 35 | 39 | 26 | 4.7 | 2.5 | .34 | .05 |
| 6904 | 03′45″ | 05′12″ | 475 | 0 | .268 | 6/89 | 4 | 1 | 1.2 | 2.5 | .67 | .01 |
| 6907 | 04′42″ | 06′12″ | 367 | 0 | .435 | 6/93 | 1 | 0 | 1.8 | 1.4 | .18 | 0 |
| 6909 | 01′50″ | 02′30″ | 352 | 230 | .014 | 5/7 | 62 | 26 | 3.3 | 2.5 | .83 | .06 |
| 6910 | 02′13″ | 05′05″ | 548 | 35 | .024 | 15 | 65 | 20 | 2.7 | 2.5 | .82 | .06 |
| 6911 | 01′00″ | 05′35″ | 644 | 0 | .072 | 61 | 33 | 6 | 1.5 | 1.5 | .34 | .02 |
| 6912 | 33°59′20″ | 04′23″ | 721 | 0 | .051 | 35 | 57 | 8 | 1.5 | 2.0 | .44 | .04 |
| 6913 | 58′30″ | 01′44″ | 792 | 0 | .008 | 2 | 63 | 35 | 1.0 | 5.5 | 1.95 | .22 |
| 7521 | 57′16″ | 118°59′25″ | 850 | 0 | | | | | | | | |

## DUME CANYON

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand (>62μ) | % Silt (62–4μ) | % Clay (<4μ) | Sorting coefficient [Trask] | $CaCO_3$ % | Organic C (direct) % | N (Kjeldahl) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2965 | 33°54'23" | 118°54'11" | 905 | 0 | | | | | | | | |
| 5046 | 59'10" | 48'15" | 398 | 0 | | | | | | 2.9 | | .12 |
| 5505 | 59'15" | 48'15" | 374 | 27 | | | | | | 9.8 | | .03 |
| 5674 | 58'17" | 48'27" | 507 | 30 | | | | | | | | |
| 5676 | 57'22" | 49'15" | 652 | 0 | | | | | | | | |
| 6895 | 47'50" | 48'35" | 556 | 0 | .082 | 79 | 14 | 7 | 1.3 | 2.4 | 1.87 | .18 |
| 6915 | 59'25" | 48'40" | 299 | 0 | .014 | 11 | 72 | 17 | 3.3 | 1.9 | .58 | .04 |
| 6916 | 58'30" | 48'15" | 530 | 15 | .022 | 19 | 59 | 22 | 3.5 | 3.1 | 1.64 | .18 |
| 6917 | 57'12" | 49'00" | 711 | 0 | .013 | 11 | 62 | 27 | 3.0 | 4.3 | 1.89 | .22 |
| 6918 | 56'25" | 50'48" | 741 | 0 | .012 | 10 | 61 | 29 | 3.1 | 4.0 | 2.07 | .21 |
| 7520 | 57'18" | 48'36" | 580 | 0 | | | | | | | | |

## Santa Monica Canyon

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand (>62μ) | % Silt (62–4μ) | % Clay (<4μ) | Sorting coefficient [Trask] | CaCo₃ % | Organic C (direct) % | N (Kjeldahl) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2999 | 33°53′11″ | 118°40′00″ | 454 | 105 | .035 | 14 | 68 | 18 | 2.4 | | | |
| 3000 | 55′12″ | 37′30″ | 268 | 132 | | | | | | | | |
| 3176 | 51′58″ | 41′57″ | 612 | 30 | .009 | 2 | 72 | 26 | 2.4 | | | |
| 3177 | 53′26″ | 41′36″ | 542 | 30 | .016 | 6 | 67 | 27 | 3.2 | | | |
| 3178 | 54′38″ | 39′48″ | 431 | 70 | .010 | 10 | 68 | 22 | 3.1 | | | |
| 3179 | 55′39″ | 38′00″ | 362 | 50 | .038 | 20 | 61 | 19 | 1.3 | | | |
| 3180 | 55′30″ | 35′55″ | 330 | 0 | .043 | 37 | 51 | 12 | 2.6 | | | |
| 3399 | 52′08″ | 39′15″ | 463 | 190 | .042 | 14 | 73 | 13 | 1.3 | 12.8 | | |
| 6776 | 48′30″ | 41′20″ | 873 | 0 | .006 | 3 | 59 | 38 | 2.8 | 8.9 | 3.26 | .40 |
| 6777 | 51′25″ | 42′30″ | 810 | 0 | .007 | 1 | 61 | 38 | 3.0 | 8.2 | 2.85 | .32 |
| 6778 | 53′53″ | 41′55″ | 583 | 15 | .044 | 41 | 44 | 15 | 2.6 | 3.4 | .98 | .10 |
| 6779 | 55′29″ | 38′32″ | 475 | 0 | .125 | 63 | 28 | 9 | 2.8 | 2.4 | .68 | .08 |
| 6780 | 55′47″ | 33′20″ | 183 | 0 | .102 | 70 | 24 | 6 | 3.2 | 2.8 | .68 | .08 |
| 6781 | 55′58″ | 32′52″ | 116 | 0 | .233 | 14/70 | 15 | 1 | 4.6 | 2.4 | .94 | .06 |
| 6783 | 55′18″ | 39′00″ | 454 | 0 | .041 | 35 | 48 | 17 | 2.9 | 4.0 | 1.54 | .17 |

## Redondo Canyon

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand ($>62\mu$) | % Silt ($62-4\mu$) | % Clay ($<4\mu$) | Sorting coefficient [Trask] | $CaCo_3$ % | Organic C (direct) % | N (Kjeldahl) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2139 | 33°41′28″ | 118°33′38″ | 801 | fan | | | | | | | | |
| 2148 | 49′32″ | 25′53″ | 298 | 0 | | | | | | | | |
| 2149 | 49′54″ | 25′27″ | 239 | 0 | | | | | | | | |
| 2150 | 47′56″ | 31′16″ | 575 | 30 | | | | | | | | |
| 2151 | 48′06″ | 30′39″ | 542 | 60 | | | | | | | | |
| 2189 | 48′33″ | 28′30″ | 422 | 0 | | | | | | | | |
| 2190 | 49′19″ | 26′38″ | 344 | 10 | | | | | | | | |
| 2191 | 49′42″ | 25′18″ | 232 | 7 | | | | | | | | |
| 2192 | 49′58″ | 24′20″ | 113 | 35 | | | | | | | | |
| 2322 | 40′02″ | 26′03″ | 853 | fan | | | | | | | | |
| 2359 | 48′00″ | 26′03″ | 57 | shelf | | | | | | | | |
| 2361 | 47′03″ | 30′07″ | 310 | basin slope | .060 | 48 | 40 | 12 | 2.0 | | | |
| 2362 | 46′02″ | 31′52″ | 652 | fan | .031 | 20 | 60 | 20 | 1.9 | | | |
| 2363 | 41′55″ | 30′06″ | 794 | fan | | | | | | | | |
| 2403 | 44′08″ | 28′00″ | 741 | fan | | | | | | | | |
| 2404 | 41′58″ | 28′00″ | 810 | fan | | | | | | | | |
| 2405 | 41′58″ | 28′00″ | 846 | fan | | | | | | | | |
| 2419 | 42′00″ | 26′03″ | 808 | fan | | | | | | | | |
| 2420 | 40′00″ | 30′04″ | 848 | fan | | | | | | | | |
| 2432 | 40′02″ | 32′01″ | 834 | fan | | | | | | | | |

REDONDO CANYON (Continued)

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand (>62μ) | % Silt (62–4μ) | % Clay (<4μ) | Sorting coefficient [Trask] | $CaCO_3$ % | Organic C (direct) % | N (Kjeldahl) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2474 | 33°46′03″ | 118°34′08″ | 751 | fan | | | | | | | | |
| 2475 | 44′02″ | 32′03″ | 686 | fan | | | | | | | | |
| 2476 | 44′00″ | 29′59″ | 715 | fan | | | | | | | | |
| 2619 | 42′02″ | 32′01″ | 800 | fan | | | | | | | | |
| 2620 | 44′02″ | 33′59″ | 774 | fan | | | | | | | | |
| 2723 | 46′00″ | 30′00″ | 602 | fan | | | | | | | | |
| 2725 | 50′00″ | 28′00″ | 107 | 300 | | rock and gravel | | | | | | |
| 2726 | 50′00″ | 30′00″ | 130 | 370 | .026 | 4 | 79 | 17 | 2.4 | | | |
| 2727 | 50′00″ | 32′00″ | 122 | 430 | .058 | 47 | 45 | 8 | 1.5 | | | |
| 2729 | 45′59″ | 35′50″ | 825 | fan | | | | | | | | |
| 2789 | 49′59″ | 34′05″ | 167 | basin slope | .005 | 2 | 53 | 45 | | | | |
| 2790 | 49′58″ | 36′00″ | 334 | basin slope | .027 | 24 | 58 | 18 | 2.8 | | | |
| 2791 | 48′00″ | 36′03″ | 769 | fan | .007 | 2 | 54 | 44 | | | | |
| 2792 | 47′59″ | 33′59″ | 556 | basin slope | .023 | 13 | 65 | 22 | 3.0 | | | |
| 2793 | 48′00″ | 32′00″ | 465 | 125 | .038 | 36 | 42 | 22 | 4.7 | | | |
| 2794 | 44′02″ | 36′00″ | 796 | fan | | | | | | | | |
| 3163 | 49′53″ | 24′32″ | 111 | 37 | .006 | 2 | 70 | 28 | 2.6 | | | |
| 3164 | 49′52″ | 24′37″ | 148 | 0 | .039 | 36 | 56 | 8 | 2.8 | | | |
| 3166 | 49′15″ | 27′14″ | 363 | 5 | .029 | 33 | 56 | 11 | 3.1 | | | |
| 3167 | 48′16″ | 29′38″ | 519 | 40 | .043 | 40 | 50 | 10 | 2.9 | | | |

REDONDO CANYON (Continued)

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand ($>62\mu$) | % Silt ($62–4\mu$) | % Clay ($<4\mu$) | Sorting coefficient [Trask] | $CaCO_3$ % | Organic C (direct) % | N (Kjeldahl) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3168 | 33°47′40″ | 118°32′10″ | 554 | 35 | .043 | 35 | 53 | 12 | 2.6 | | | |
| 3169 | 46′33″ | 33′42″ | 706 | fan | .013 | 4 | 81 | 15 | 2.5 | | | |
| 3385 | 50′00″ | 32′23″ | 120 | 430 | .042 | 17 | 75 | 8 | 1.3 | 20.8 | | |
| 5960 | 50′18″ | 33′50″ | 146 | 400 | .072 | 62 | 33 | 5 | 1.4 | 11.7 | | .07 |
| 6774 | 47′04″ | 32′50″ | 660 | fan | .015 | 9 | 63 | 28 | 3.4 | 4.7 | 1.68 | .18 |
| 6775 | 46′32″ | 34′15″ | 786 | fan | .009 | 2 | 63 | 35 | 3.3 | 6.9 | 2.46 | .28 |
| 6815 | 49′14″ | 26′54″ | 282 | 86 | .027 | 24 | 55 | 21 | 3.1 | 5.7 | 1.12 | .09 |
| 6816 | 49′13″ | 27′04″ | 378 | 8 | .051 | 36 | 53 | 11 | 1.5 | 5.2 | 1.96 | .20 |
| 6817 | 47′56″ | 28′32″ | 76 | shelf | .019 | 19 | 58 | 23 | 3.4 | 15.7 | .78 | .07 |
| 7284 | 49′53″ | 24′31″ | 137 | 0 | .031 | 17 | 66 | 17 | 2.4 | 4.2 | 1.89 | .19 |
| 7285 | 49′52″ | 25′38″ | 246 | 0 | .015 | 5 | 80 | 15 | 3.0 | 4.8 | 2.41 | .25 |
| 7286 | 49′22″ | 26′54″ | 378 | 0 | .062 | 53 | 34 | 12 | 2.5 | 3.3 | 1.22 | .12 |
| 7286 | 49′22″ | 26′54″ | " | " | .044 | 40 | 45 | 15 | 3.3 | 3.9 | 1.20 | .14 |
| 7286 | 49′22″ | 26′54″ | " | " | .043 | 41 | 43 | 16 | 3.5 | 4.0 | 1.42 | .16 |
| 7287 | 48′45″ | 27′53″ | 431 | 0 | .038 | 38 | 45 | 17 | 3.2 | 2.8 | 1.10 | .12 |
| 7287 | 48′45″ | 27′53″ | " | " | .029 | 29 | 51 | 20 | 3.3 | 3.9 | 1.51 | .15 |
| 7288 | 48′29″ | 29′14″ | 503 | 0 | .062 | 50 | 36 | 14 | 2.9 | 3.1 | .98 | .09 |
| 7288 | 48′29″ | 29′14″ | " | " | .088 | 76 | 17 | 7 | 1.4 | 2.4 | .57 | .05 |
| 7289 | 48′14″ | 30′50″ | 560 | 0 | .353 | 95 | 4 | 1 | 1.7 | 3.0 | .26 | .02 |
| 7289 | 48′14″ | 30′50″ | " | " | .036 | 34 | 47 | 19 | 3.3 | 4.2 | 1.33 | .14 |
| 7290 | 27′35″ | 26′58″ | 611 | 0 | .036 | 25 | 59 | 16 | 2.2 | 5.2 | .94 | .08 |

SAN PEDRO SEA VALLEY

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand (>62μ) | % Silt (62–4μ) | % Clay (<4μ) | Sorting coefficient [Trask] | $CaCO_3$ % | Organic C (direct) % | N (Kjeldahl) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2218 | 33°40′01″ | 118°19′59″ | 459 | 250 | | | | | | | | |
| 2219 | 41′02″ | 20′21″ | 437 | 300 | | | | | | | | |
| 2317 | 38′00″ | 17′57″ | 522 | 0 | | | | | | | | |
| 2336 | 38′09″ | 19′52″ | 666 | 20 | | | | | | | | |
| 5639 | 37′54″ | 18′50″ | 461 | 200 | | | | | | | | |
| 6501 | 39′34″ | 16′47″ | 319 | 0 | | | | | | | | |
| 6502 | 38′48″ | 17′15″ | 547 | 0 | | | | | | | | |
| 6503 | 38′36″ | 18′58″ | 661 | 0 | | | | | | | | |
| 6854 | 39′45″ | 16′28″ | 187 | 0 | .013 | 18 | 53 | 29 | 4.0 | 2.8 | 1.76 | .16 |
| 6855 | 39′45″ | 16′28″ | 187 | 0 | .022 | 20 | 55 | 25 | 3.8 | 3.2 | 1.72 | .17 |
| 6856 | 39′00″ | 16′50″ | 404 | 0 | .009 | 13 | 55 | 32 | 3.6 | 3.6 | 1.70 | .18 |
| 6861 | 38′40″ | 20′10″ | 716 | 0 | .011 | 9 | 60 | 31 | 3.3 | 4.6 | 2.07 | .22 |
| 7155 | 38′08″ | 18′20″ | 468 | 150 | | | | | | | | |
| 7160 | 39′14″ | 16′54″ | 406 | 100 | .019 | 15 | 62 | 23 | 3.1 | 4.3 | 1.52 | .17 |
| 7160 | 39′14″ | 16′54″ | " | " | .082 | 57 | 30 | 13 | 3.3 | 4.9 | .55 | .05 |
| 7161 | 37′50″ | 16′44″ | 220–90 | 250 | | | | | | 1.4 | .52 | .05 |
| 7161 | 37′27″ | 16′18″ | | | | | | | | | | |
| 7162 | 37′48″ | 15′24″ | 92 | 0 | .054 | 42 | 54 | 4 | 1.4 | 1.5 | .41 | .05 |
| 7163 | 37′21″ | 15′38″ | 61 | 119 | .067 | 58 | 42 | 0 | 1.4 | 1.1 | .23 | .03 |
| 7164 | 37′15″ | 16′49″ | 133 | 357 | .054 | 35 | 59 | 6 | 1.3 | 1.6 | .37 | .05 |
| 7165 | 37′42″ | 16′00″ | 158 | 72 | .044 | 14 | 82 | 4 | 1.2 | 1.9 | .50 | .05 |
| 7166 | 38′08″ | 16′03″ | 262 | 0 | .036 | 28 | 55 | 17 | 2.4 | 2.6 | 1.06 | .12 |

SAN PEDRO SEA VALLEY (Continued)

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand (>62μ) | % Silt 62–4μ | % Clay (<4μ) | Sorting coefficient [Trask] | $CaCO_3$ % | N (Kjeldahl) % | Organic C (direct) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7167 | 33°38′26″ | 118°15′24″ | 58 | 57 | .067 | 55 | 39 | 6 | 1.4 | 2.4 | .38 | .05 |
| 7168 | 38′45″ | 16′18″ | 174 | 191 | .051 | 56 | 37 | 7 | 1.4 | 2.3 | .53 | .06 |
| 7169 | 38′28″ | 16′43″ | 386 | 64 | .029 | 26 | 54 | 20 | 3.1 | 3.3 | 1.36 | .15 |
| 7170 | 38′14″ | 17′12″ | 545 | 0 | .013 | 16 | 68 | 16 | 3.1 | 3.6 | 1.79 | .19 |
| 7171 | 37′48″ | 17′14″ | 184 | 316 | .054 | 64 | 31 | 5 | 1.3 | 1.6 | .41 | .05 |
| 7172 | 39′05″ | 16′36″ | 271 | 119 | .038 | 41 | 43 | 16 | 1.2 | 3.4 | 1.25 | .12 |
| 7173 | 39′10″ | 16′06″ | 58 | 172 | | | | | | 2.7 | .71 | .08 |
| 7174 | 38′36″ | 16′16″ | 221 | 200 | .047 | 47 | 45 | 8 | 1.4 | 2.5 | .66 | .07 |
| 7175 | 39′34″ | 18′22″ | 430–180 | 300 | .041 | 36 | 53 | 11 | 1.9 | 3.0 | .87 | .09 |
| 7175 | 40′06″ | 17′32″ | | | | | | | | | | |
| 7176 | 39′48″ | 17′17″ | 67 | 198 | .042 | 82 | 18 | 0 | 1.4 | 3.1 | .51 | .05 |
| 7177 | 39′22″ | 17′38″ | 414 | 0 | .018 | 14 | 66 | 20 | 2.7 | 3.7 | 1.50 | .16 |
| 7178 | 39′00″ | 17′46″ | 481 | 29 | .024 | 15 | 74 | 11 | 2.3 | 4.4 | 1.40 | .16 |
| 7179 | 38′50″ | 17′06″ | 402 | 68 | .011 | 9 | 58 | 33 | 1.1 | 3.5 | 1.70 | .18 |
| 7180 | 37′52″ | 18′00″ | 350 | 210 | .044 | 46 | 40 | 14 | 1.4 | 2.5 | .70 | .08 |
| 7181 | 38′06″ | 18′12″ | 500 | 90 | .017 | 12 | 70 | 18 | 1.3 | 4.0 | 1.50 | .17 |
| 7182 | 38′00″ | 18′58″ | 445 | 185 | .047 | 47 | 39 | 14 | 1.8 | 2.3 | .68 | .07 |
| 7183 | 38′43″ | 18′17″ | 564 | 56 | .016 | 9 | 63 | 28 | 1.1 | 5.4 | 1.68 | .20 |

## Newport Canyon

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand ($>62\mu$) | % Silt ($62\text{-}4\mu$) | % Clay ($<4\mu$) | Sorting coefficient [Trask] | $CaCO_3$ % | Organic C (direct) % | N (Kjeldahl) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5006 | 33°36′10″ | 117°56′00″ | 37 | 0 | | | | | | 6.6 | | .12 |
| 5250 | 36′14″ | 55′54″ | 37 | 0 | .055 | 48 | 42 | 10 | 1.6 | | | |
| 5367 | 35′46″ | 55′57″ | 97 | 0 | | | | | | 1.7 | | .16 |
| 5661 | 35′35″ | 55′58″ | 140 | 10 | | | | | | 2.5 | | .11 |
| 7025 | 35′52″ | 55′56″ | 62 | 0 | .027 | 15 | 64 | 21 | 2.7 | .9 | 1.03 | .12 |
| 7026 | 34′57″ | 55′45″ | 182 | 0 | .029 | 27 | 53 | 20 | 3.0 | 1.1 | .95 | .08 |
| 7027 | 34′13″ | 55′28″ | 253 | 0 | .041 | 43 | 39 | 18 | 3.0 | 1.2 | .73 | .08 |
| 7028 | 34′13″ | 55′28″ | 272 | 0 | .024 | 30 | 56 | 14 | 1.7 | .9 | .70 | .08 |
| 7029 | 35′05″ | 55′45″ | 170 | 4 | .026 | 5 | 75 | 20 | 2.5 | 1.1 | 1.05 | .11 |
| 7030 | 35′43″ | 55′54″ | 85 | 3 | .022 | 9 | 79 | 12 | 1.8 | .9 | 1.14 | .12 |
| 7031 | 36′24″ | 55′54″ | 16 | 0 | .046 | 44 | 49 | 7 | 1.4 | 1.0 | .57 | .05 |
| 7032 | 31′28″ | 54′58″ | 478 | 2 | .038 | 36 | 56 | 8 | 3.1 | 1.3 | .74 | .07 |
| 7050 | 26′27″ | 52′00″ | 642 | 0 | | | | | | .7 | .03 | 0 |
| 7051 | 29′36″ | 53′44″ | 553 | 0 | .116 | 87 | 10 | 3 | 1.6 | .2 | .03 | 0 |
| 7052 | 31′10″ | 56′08″ | 420 | 58 | .036 | 16 | 67 | 17 | 2.3 | 2.7 | .88 | .10 |
| 7053 | 32′45″ | 55′20″ | 396 | 0 | .088 | 60 | 29 | 11 | 2.8 | 1.0 | .68 | .08 |
| 7054 | 34′23″ | 55′48″ | 178 | 91 | | | | | | 5.7 | .39 | .02 |
| 7054 | 34′23″ | 55′48″ | " | " | .041 | 32 | 55 | 13 | 1.9 | 1.7 | .59 | .07 |
| 7055 | 35′53″ | 56′02″ | 76 | 46 | .033 | 18 | 64 | 18 | 2.6 | 1.7 | .86 | .09 |
| 7685 | 15′00″ | 43′30″ | 734 | 0 | | | | | | | | |
| 7728 | 20′30″ | 44′54″ | 741 | 0 | | | | | | | | |
| 7729 | 35′00″ | 55′36″ | 211 | 20 | | | | | | | | |
| 7730 | 34′54″ | 55′30″ | 235 | 0 | | | | | | | | |

## LA JOLLA CANYON

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand (>62μ) | % Silt (62-4μ) | % Clay (<4μ) | Sorting coefficient [Trask] | $CaCO_3$ % | Organic C (direct) % | N (Kjeldahl) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7033 | 32°51′30″ | 117°15′55″ | 102 | 2 | .189 | 94 | 3 | 3 | 1.6 | 1.2 | .16 | .01 |
| 7034 | 52′18″ | 15′48″ | 163 | 0 | | | | | | 1.2 | .58 | .08 |
| 7036 | 53′12″ | 17′12″ | 369 | 7 | .072 | 69 | 23 | 8 | 1.5 | 1.0 | .81 | .09 |
| 7038 | 52′48″ | 16′32″ | 121 | 200 | .041 | 35 | 48 | 17 | 2.6 | 2.2 | .94 | .10 |
| 7039 | 53′12″ | 17′00″ | 371 | 13 | .095 | 92 | 5 | 3 | 1.4 | .9 | .44 | .04 |
| 7040 | 54′42″ | 23′38″ | 637 | 0 | .103 | 92 | 6 | 2 | 1.3 | .8 | .16 | .01 |
| 7041 | 54′02″ | 23′30″ | 545 | 90 | .010 | 3 | 67 | 30 | 3.1 | 9.8 | 3.07 | .36 |
| 7043 | 57′23″ | 15′55″ | 135 | 0 | .144 | 94 | 5 | 1 | 1.4 | 1.6 | .14 | .02 |
| 7044 | 52′21″ | 15′27″ | 79 | 0 | .077 | 72 | 22 | 6 | 1.5 | 1.1 | .51 | .06 |
| 7045 | 52′06″ | 16′24″ | 274 | 11 | .095 | 88 | 9 | 3 | 1.3 | .8 | .48 | .06 |
| 7046 | 54′18″ | 19′44″ | 517 | 0 | .074 | 72 | 25 | 3 | 1.4 | 1.2 | .76 | .07 |
| 7047 | 54′21″ | 29′33″ | 793 | 0 | .062 | 53 | 38 | 9 | 2.1 | 3.1 | 1.06 | .12 |
| 7048 | 52′43″ | 29′11″ | 708 | 90 | .007 | 1 | 61 | 38 | 3.5 | 9.9 | 3.56 | .42 |
| 7049 | 49′37″ | 35′12″ | 976 | 0 | .011 | 4 | 57 | 39 | 3.4 | 5.8 | 2.33 | .23 |
| 7049 | 49′37″ | 35′12″ | " | " | .102 | 82 | 11 | 7 | 1.3 | 1.6 | .18 | .01 |

## CORONADO CANYON

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand ($>62\mu$) | % Silt ($62$-$4\mu$) | % Clay ($<4\mu$) | Sorting coefficient [Trask] | $CaCO_3$ % | Organic C (direct) % | N (Kjeldahl) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6842 | 33°22′50″ | 117°22′12″ | 1265 | 0 | .041 | 40 | 50 | 10 | 1.6 | 6.4 | 1.25 | .10 |
| 6843 | 22′45″ | 118°21′43″ | 1203 | 0 | .024 | 18 | 60 | 22 | 3.3 | 8.5 | 2.77 | .28 |
| 6844 | 27′00″ | 22′18″ | 1105 | 17 | .017 | 12 | 60 | 28 | 1.2 | 8.6 | 2.15 | .24 |
| 6844 | 27′00″ | 22′18″ | " | " | .044 | 41 | 45 | 14 | 4.6 | 21.4 | 1.18 | .09 |
| 6845 | 30′16″ | 117°16′50″ | 177 | 2 | .046 | 38 | 52 | 10 | 1.5 | 3.2 | .97 | .08 |
| 6846 | 30′15″ | 16′04″ | 123 | 9 | .072 | 66 | 31 | 3 | 1.6 | 3.3 | .80 | .07 |
| 6847 | 30′15″ | 16′48″ | 174 | 0 | .051 | 38 | 55 | 7 | 1.5 | 4.4 | 1.05 | .11 |
| 6848 | 30′58″ | 18′34″ | 356 | 0 | .033 | 16 | 71 | 13 | 2.3 | 6.7 | 1.95 | .21 |
| 6849 | 30′58″ | 18′34″ | 344 | 9 | .005 | 1 | 54 | 45 | 3.1 | 4.9 | 2.43 | .26 |
| 6850 | 29′48″ | 22′58″ | 960 | 9 | .032 | 31 | 55 | 14 | 3.3 | 14.1 | 2.33 | .15 |
| 6851 | 30′42″ | 21′37″ | 812 | 5 | .022 | 5 | 78 | 17 | 2.3 | 7.6 | 2.23 | .27 |
| 6852 | 31′20″ | 20′12″ | 566 | 29 | .005 | 6 | 49 | 45 | 1.2 | 3.3 | 3.82 | .27 |
| 6852 | 31′20″ | 20′12″ | " | " | .036 | 32 | 59 | 9 | 2.1 | 10.0 | 1.46 | .16 |

SANTA CRUZ CANYON

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand ($>62\mu$) | % Silt ($62\text{-}4\mu$) | % Clay ($<4\mu$) | Sorting coefficient [Trask] | $CaCO_3$ % | Organic C (direct) % | N (Kjeldahl) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6803 | 33°59′32″ | 119°55′55″ | 89 | 0 | .268 | 93 | 7 | 0 | 1.5 | 16.1 | .56 | .02 |
| 6804 | 56′25″ | 50′32″ | 459 | 0 | .250 | 90 | 10 | 0 | 1.6 | 12.3 | 1.04 | .07 |
| 6806 | 56′06″ | 52′17″ | 221 | 120 | | | | | | 36.6 | 1.51 | .08 |
| 6806 | 56′06″ | 52′17″ | " | " | | | | | | 10.4 | 7.36 | .38 |
| 6808 | 54′30″ | 47′22″ | 902 | 0 | .028 | 31 | 45 | 24 | 1.3 | 12.0 | 2.09 | .20 |
| 6808 | 54′30″ | 47′22″ | " | 0 | .047 | 46 | 36 | 18 | 1.1 | 12.0 | 1.74 | .18 |
| 6809 | 54′39″ | 46′24″ | 623 | 350 | 3.46 | 88 | 8 | 4 | 4.7 | 30.7 | 2.30 | .05 |
| 6810 | 53′00″ | 45′32″ | 1387 | 0 | .006 | 7 | 52 | 41 | 3.7 | 14.1 | 3.41 | .40 |
| 6810 | 53′00″ | 45′32″ | " | " | .088 | 68 | 22 | 10 | 2.0 | 11.8 | 1.19 | .07 |
| 6811 | 51′20″ | 44′53″ | 1624 | fan | .006 | 3 | 57 | 40 | 3.3 | 11.3 | 3.44 | .46 |
| 6812 | 54′17″ | 45′42″ | 676 | 400 | .054 | 49 | 38 | 13 | 1.8 | 11.6 | 1.19 | .11 |

### Santa Catalina Canyon

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand ($>62\mu$) | % Silt ($62-4\mu$) | % Clay ($<4\mu$) | Sorting coefficient [Trask] | $CaCO_3$ % | Organic C (direct) % | N (Kjeldahl) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2847 | 33°22′30″ | 118°36′58″ | 914 | 0 | | | | | | | | |
| 6818 | 22′53″ | 30′57″ | 362 | 37 | .028 | 17 | 64 | 19 | 2.9 | 8.0 | .76 | .09 |
| 6819 | 22′54″ | 31′07″ | 379 | 0 | .031 | 16 | 66 | 18 | 2.6 | 7.8 | .94 | .11 |
| 6820 | 23′11″ | 32′11″ | 559 | 0 | .040 | 40 | 47 | 13 | 2.2 | 11.9 | 1.12 | .07 |
| 6821 | 23′46″ | 31′57″ | 266 | 300 | | | | | | | | |
| 6822 | 23′10″ | 30′01″ | 216 | 0 | .029 | 7 | 76 | 17 | 2.9 | 6.0 | .90 | .10 |
| 6823 | 23′10″ | 29′38″ | 88 | 0 | .018 | 8 | 68 | 24 | 2.5 | 4.3 | .85 | .07 |
| 6824 | 23′10″ | 30′01″ | 206 | 5 | .010 | 1 | 65 | 34 | 4.1 | 4.7 | .96 | .12 |
| 6825 | 23′10″ | 31′15″ | 363 | 0 | .031 | 13 | 67 | 20 | 2.7 | 5.9 | .98 | .12 |
| 6826 | 22′51″ | 34′08″ | 716 | 0 | | | | | | | 1.06 | .07 |
| 6827 | 20′17″ | 38′45″ | 1245 | 90 | .015 | 17 | 56 | 27 | 3.8 | 8.1 | 2.69 | .30 |
| 6828 | 20′30″ | 39′05″ | 1272 | 0 | .007 | 4 | 59 | 37 | 3.9 | 14.4 | 3.51 | .37 |
| 6829 | 22′47″ | 36′10″ | 853 | 27 | | | | | | | 1.49 | .08 |
| 6830 | 22′58″ | 34′00″ | 708 | 9 | | | | | | 3.0 | 1.53 | .13 |
| 6831 | 23′57″ | 34′25″ | 549 | 190 | .019 | 4 | 73 | 23 | 3.2 | 11.8 | 2.01 | .20 |

## San Clemente Rift Valley

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand (>62μ) | % Silt (62-4μ) | % Clay (<4μ) | Sorting coefficient [Trask] | $CaCO_3$ % | Organic C (direct) % | N % (Kjeldahl) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6838 | 32°48′10″ | 118°17′50″ | 950 | 7 | | | | | | 16.7 | 1.49 | .05 |
| 6839 | 46′30″ | 15′43″ | 1406 | 0 | .203 | 91 | 7 | 2 | 8.9 | 14.0 | 1.40 | .05 |
| 6840 | 44′35″ | 12′45″ | 1620 | 186 | | | | | | .6 | .13 | .01 |
| 6841 | 44′29″ | 12′30″ | 1591 | 250 | | | | | | 24.1 | 1.46 | .05 |

## Tanner Canyon

| Sample No. | Lat. | Long. | Depth [m] | Height above axis [m] | Median diameter [mm] | % Sand (>62μ) | % Silt (62-4μ) | % Clay (<4μ) | Sorting coefficient [Trask] | $CaCO_3$ % | Organic C (direct) % | N (Kjeldahl) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6832 | 32°33′36″ | 118°55′40″ | 1298 | 3 | .024 | 29 | 46 | 25 | 3.7 | 35.2 | 3.29 | .12 |
| 6832 | 33′36″ | 55′40″ | " | " | .095 | 69 | 22 | 9 | 1.9 | 22.2 | 1.73 | .08 |
| 6833 | 37′54″ | 58′40″ | 813 | 7 | .134 | 93 | 7 | 0 | 1.3 | 14.6 | 1.10 | .05 |
| 6834 | 39′24″ | 119°01′24″ | 603 | 13 | .062 | 62 | 29 | 9 | 1.8 | 27.9 | 2.57 | .12 |
| 6835 | 37′06″ | 07′15″ | 298 | 0 | .218 | 99 | 1 | 0 | 1.3 | 13.0 | .87 | .02 |
| 6836 | 36′00″ | 05′18″ | 496 | 11 | | | | | | | | |
| 6837 | 34′36″ | 02′48″ | 641 | 53 | .053 | 67 | 27 | 6 | 1.5 | 29.4 | 2.98 | .01 |

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 27 PART 2

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## PART II

## BIOLOGY

BY

OLGA HARTMAN

UNIVERSITY OF SOUTHERN CALIFORNIA PRESS
LOS ANGELES, CALIFORNIA
1963

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 27 PART 2

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## PART II

## BIOLOGY

BY

OLGA HARTMAN

UNIVERSITY OF SOUTHERN CALIFORNIA PRESS
LOS ANGELES, CALIFORNIA
1963

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

Part II

BIOLOGY

*by* OLGA HARTMAN

The University of Southern California Publications
Allan Hancock Pacific Expeditions

Volume 27, Part II

Issued December 30, 1963

Price $15.00

University of Southern California Press
Los Angeles, California

## TABLE OF CONTENTS

# LIST OF FIGURES

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## PART II
## BIOLOGY

By Olga Hartman

## INTRODUCTION

This study of the benthic fauna of the submarine canyons off southern California is the third in a series of areal studies on the quantitative, ecological, and systematic evaluations of the marine benthic invertebrate animals existing along the borderlands of southern California. A biological sampling program was begun in 1952, along the shelf and slope lands of the San Pedro area, using a large orange-peel-grab sampler, covering about a fourth of a square meter of surface. The analysis of more than two hundred samples from the San Pedro area resulted in the recovery of several hundred kinds of invertebrate animals, with locations showing their distribution, abundance, community structure and physical environment (Hartman, 1955). The shallow bottoms of Santa Monica Bay were next sampled, chiefly in the environs of outfall lines, from shallowest shelf to slope depths. The results (Hartman, 1956) showed the possible effects of waste products on the kinds, numbers and productivity of bottom areas. Analyses of 150 samples revealed the predominance of polychaetes in shallowest depths, followed by polychaetes with small crustaceans and pelecypods in deeper bottoms. A more diversified fauna but lower in standing crop was found in areas more remote from waste bottoms.

The shelf depths off southern California, from Point Conception to south of the Mexican border, were next sampled. Several thousand quantitative samples were taken between 1955 and 1960. The analyzed results, based on more than 200 samples completely classified, revealed the presence of many kinds of animals existing in predictable associations and changing with kinds of sediments, distance from shore, depth of bottom, and other physical factors. The detailed analyses (Hartman, in press) are voluminous; they provide data on more than 1700 species of invertebrate animals, including chiefly polychaetes, echinoderms, small crustaceans (mainly amphipods), mollusks (mainly small pelecypods), echiuroids, and a few other kinds.

Following the shelf studies, the investigations were concerned with thirteen deep, submarine basins off southern California. One hundred seventy-two large Campbell grab samples were taken in depths of 627 to 2571 meters. Their analyses resulted in the documentation (Hartman and Barnard, 1958-60) of 317 species of metazoan animals. They belonged chiefly to four major groups of animals with the following distribution: 170 kinds of polychaetes; 55 crustaceans of which 34 were amphipods, 10 isopods, 3 tanaids, 2 cumaceans, 2 ghost shrimps, 1 munnid crab and 3 or more ostracods; 30 echinoderms of which 22 were ophiuroids; 35 mollusks of which 17 were pelecypods, the other 18 including gastropods, scaphopods and solenogasters; 27 other species including coelenterates, echiuroids, sipunculids, enteropneusts and ascidians. Highest specific values were found in the Catalina and San Pedro basins, with 119 and 115 specimens to a square meter respectively, and lowest values were in Santa Monica, a longshore basin, and San Nicolas and West Cortez basins, each with 12 specimens to a square meter. Standing crop values were uniformly low, ranging from about 50 grams to a square meter (in a sample from an outer basin, containing a large echiuroid) to a low of 1.5 grams to a square meter in San Clemente basin. The number of specimens varied from a high of 123 to a square meter in Catalina basin, to a low of 11 in Santa Monica basin.

The continuation of the benthic program resulted in the recovery of many species unknown to science. Some have been described (Hartman, 1961, and Barnard, 1959-1962), but many others, especially from the lower ends of canyons, remain to be done and are currently under study.

The third aspect of the benthic program was the investigation of the submarine canyons, of which 13 were sampled and the biological results given below. This sequence of studies—shelf, basin, canyon—from a single geographic area, the borderlands of southern California, makes possible a comparison of quantitative biological evaluations. It should be noted, however, that slope depths are still largely unexplored, and future studies might concern themselves with sampling these areas, starting at about the 200 meter depth to threshold depths of all the basins.

The procedures for taking and processing the samples have varied little except for the substitution of a larger, Campbell grab in deeper bottoms, instead of the smaller orange-peel-grab used in the first

studies. The results may not have differed much, however, because the hard-packed sediments in many shelf depths (100 meters or less) are not easily taken with either orange-peel, or Campbell, or any other kind of grab.

The thirteen largest offshore submarine canyons of southern California (Fig. 1) are scattered along the shelves, where they cross


Fig. 1. Index map showing the locations of the thirteen submarine canyons biologically sampled.

slopes, extend to basins, and occur also out beyond the offshore islands. Compared to the oval-shaped basins, which comprise about a third of the offshore area and attain depths of 627 to 2107 meters, the canyons comprise much less area, are V-shaped furrows or valleys, in some places extending from the shallow shelf near shore to the deep basins, where they form broad fans. These thirteen canyons differ in location, source and in physical features. Nine border the mainland and include those named from Hueneme south to Coronado canyon (see list below);

three border islands: Santa Cruz, Catalina and San Clemente canyons; and one, Tanner, borders submarine banks. Some of those along shore dissect almost the entire mainland shelf; such are Hueneme, Mugu, Dume, Redondo, Newport and La Jolla canyons. Three others, Santa Monica, San Pedro and Coronado canyons, cross only an outer end of the shelf lands. Most of those bordering the mainland have their axes at right angles to the mainland or curve counter clock-wise in a southeasterly direction, from head to mouth ends. Because of their proximity to the shelf, their faunal assemblages might be expected to resemble those in shallower bottoms; this expectation has been only partly realized, as shown below.

Typically a canyon consists of head, or upper, and mouth, or lower ends, with walls of varying steepness, an axis, and a fan where it adjoins the basin or trough adjacent to it. The degree of slope varies so that there is a gradual decrease downward.

The biological samples were taken at pre-selected sites along the lengths of the canyons, which range in length from 4 to 15 miles. Their lengths are approximately: Mugu, 4 miles; Dume and San Pedro, each 5; Newport, 6; Hueneme and Catalina, each 7; Tanner, 8; Santa Monica and Redondo, each 9; Coronado, 10; San Clemente, 11; Santa Cruz, 14; and La Jolla, 15. Their depths, at the heads, vary from 15 to 950 meters, as follows, from shallowest to deepest: Mugu, 15 meters; Newport, 16 m; Redondo, 57 m; La Jolla, 79 m; Catalina, 88 m; Santa Cruz, 89 m; Hueneme, 98 m; Santa Monica, 116 m; Coronado, 123 m; San Pedro, 187 m; Tanner, 298 m; Dume, 299 m, and San Clemente, 950 meters.

Their depths at the lower ends range from 621 to 1624 meters, as follows, from shallowest to deepest: Hueneme, 621 meters; Newport, 624 m; San Pedro, 716 m; Mugu, 792 m; Redondo, 853 m; Santa Monica, 873 m; Dume, 905 m; La Jolla, 976 m; Coronado, 1265 m; Catalina, 1272 m; Tanner, 1298 m; San Clemente, 1620 m, and Santa Cruz, 1624.

Submarine canyons are known to exist throughout the world and their origins have been the subject of considerable interest, chiefly to geologists. The organisms existing in their sediments have not been studied quantitatively, neither has the possible effect of their presence on the physical aspects been explored. A study of life existing in the upper rims of La Jolla canyon was made by Limbaugh and Shepard (1957, p. 637) whose reports on the fauna were based

partly on direct diving operations and partly on dredging and photographic records. A long list of species includes fishes and invertebrate animals, chiefly those to be expected in shelf depths. Three kinds of plants were noted: *Zostera* above the rim on the south side, elkhorn kelp as isolated plants, and *Macrocystis,* another kelp, attached to large cobbles. The most conspicuous animals inhabiting the sandy bottoms were large burrowing clams and a ceriantharid anemone. Rocky outcrops supported attached purple gorgonians and vermetid gastropods; other surface dwelling forms included starfish, sea cucumbers, large snails and a few purple sea urchins. On two occasions the egg capsules of a squid, *Loligo opalescens,* were so abundant on the canyon rim that they looked like snowdrifts. Of further significance was the observation of decaying vegetation of kelp and surf grass along the canyon floor at its head; this becomes filled with sand and detritus carried by longshore currents. Submarine slides, estimated to occur about once a year, caused deepening of the canyon up to 10 to 20 feet, and was followed by subsequent filling with detritus.

The invertebrate animals named in this report are chiefly shelf species attached to hard substrata, or existing in sandy or shaley or rocky bottoms. The study did not extend into the deeper parts of either La Jolla or Scripps canyons, but noted that the associations of animals possibly extended beyond the limits studied (see Results, below).

The physical aspects of canyons, their stability or occasional change, and the remarkable uniformity may be partly due to the existing biota, especially since it has been found that like sediments support similar organisms within a canyon, in a range of depth, but that they may differ from those in adjacent shelf, or slope or basin depths, and in other canyons.

Another current study on California canyons is that by Peckham and McLean (1961, p. 43), concerned with the fauna of the head of the rock-walled Carmel submarine canyon, in depths to 200 feet, using diving technics. These authors reported on a transition in the fauna at depths of 70 to 100 feet, chiefly characterized by the replacement of plants for attached corals, sponges, bryozoans and other epifaunal organisms.

## ACKNOWLEDGEMENTS

This project was supported by the Allan Hancock Foundation of the University of Southern California and the National Science Foun-

dation, grant G-9060. The biological samples were taken by the Foundation Research ship, VELERO IV, and members of the Foundation participated in the cruises. Much of the planning and performance of the field work was done under the supervision of Professor K. O. Emery and Dr. Jobst Hülsemann. The sampling sites were carefully positioned with respect to canyon walls and axes. Mr. Robert R. Given, of the Biology Department, washed many of the samples in the laboratory, and made estimates of macroscopic weights. Further breakdown and sorting in the laboratory were done by Mrs. Sonja Mulvane, laboratory assistant.

Species were identified as follows: Echinoderms by Mr. Fred Ziesenhenne, who also operated the VELERO IV on the cruises, cumaceans by Mr. Robert Given, some amphipods by Dr. J. Laurens Barnard, now at the Beaudette Foundation at Santa Ynez, California. Some mollusks were named by Dr. Myra Keen of Stanford University, others by Mr. Don Wilson, formerly a student in the biology department. To all of these participants as well as others who aided in various ways, I am indebted for much help and support. Mr. Anker Petersen prepared the plates and all illustrative material.

## METHODS

Two hundred eighty-two bottom samples were taken from the canyons of southern California, using a large Campbell grab (referred to as CG) which takes up to 130-150 liters of bottom sediment and covers an area of up to half a square meter, and a smaller orange-peel-grab (called OPG) which takes about half as much sediment and covers an area about half as large. The methods of sampling have been described in previous reports on quantitative results (see Literature Cited). The processing and weighing of macroscopic animals was done in the laboratory, by sorting from the debris or screenings all of the visible animals to major group. This has been estimated to comprise 85 to 90% of the entire animal weight of a sample. In most cases the tubes of animals were not weighed, but shells of mollusks and thick calcareous tests of echinoderms, which could not be removed without damaging the specimens, were included in total wet weights.

## SUMMARIES OF THE FAUNA IN THE SUBMARINE CANYONS

The canyons, from northernmost to southernmost along shore, are Hueneme, Mugu, Dume, Santa Monica and Redondo canyons, all

confluent with the Santa Monica basin at their lower ends. San Pedro sea valley terminates in the San Pedro basin. Newport, La Jolla and Coronado canyons merge with parts of the San Diego trough. The offshore canyons, from Santa Cruz at the north, to San Clemente rift valley at the south have the following terminations: Santa Cruz canyon merges with a basin of the same name, as do also Catalina and San Clemente canyons. Tanner cannon merges with the East Cortes basin. The lower ends of these canyons consistently share the biological features of the basins which they join. Those terminating in Santa Monica and San Pedro basins are nearly or altogether dead in their basin subsill depths. Those farther south have species to be found also in the San Diego trough.

The outermost canyons differ in most respects not only from adjacent ones, but also from longshore canyons. Specific limitations may be imposed not only by geography, location of canyon, but also by the character of its surface sediments (whether mud, sand, rock), remoteness from land areas and available food supplies or from sources of larval replenishment. Each of the canyons illustrates the fact that there are abrupt differences in faunal components inter- and intra-canyon-wise for which explanations are wanting. A far greater sampling program in most canyons might result in a resolution of these differences, if species now apparently lacking were found more widely distributed. On the other hand, it might show even greater differences than the present Analyses, if a much larger number of species were added.

Some conclusions can be stated respecting the faunas of the canyons:

(1) Each canyon is found to support a richly diversified fauna, high in specific entities, with as many as 262 species in a longshore (Newport) canyon.

(2) The largest numbers of species in a canyon occur in shallowest, or shelf depths, and they are members of the shelf or slope fauna. There is a gradual decline in numbers of species (though not necessarily specimens) with depth, but there are deviations from this principle, perhaps partly due to factors other than depth.

(3) Most species occur as single or few specimens in a sample, shown by the frequent recurrence of the number 1 in the ANALYSES (see below); these unit numbers apply to most species in most canyon depths.

(4) Many species are represented by peak or high numbers in one or a few samples, from widely dispersed places; such peak numbers may be correlated with optimum conditions for the species, with gregariousness, or with recent spat-falls of individual species, but not usually with food concentrations.

(5) The replacement of species from one canyon to the next is such that from 30% to 60% are different. These differences may be partly correlated with latitude, with change in sediments, with distance from shore, or with other, still unknown factors, concerned with the biology of specific entities.

(6) Replacement of species within a canyon with increasing depth is also abrupt, so that more than 50% of the species may differ from one depth class to the next. These step-down effects are illustrated below.

Analyses of these canyon samples have resulted in thousands of individual facts relating to the abundance or sparsity of life, to the distribution and numbers of kinds of animals of individual species, and to their occurrences in major phylogenetic groups. It is believed they represent conditions as they exist in nature, but the figures of abundance can be regarded only as minimal since only those unit parts which reach the final stage in processing can be counted. Some of the most conspicuous features are the associations of species in a sort of community structure, suggesting an obligatory relation that transcends systematic categories. Most of the species encountered in the sediments are presumably deposit feeders and perhaps not competitive for food supplies. Predators, such as large nemerteans, ceriantharians, seastars, show spatial relations that space them at more than a station apart.

The sharpest breaks from one canyon to the next, concerning numbers and kinds, are shown between Monterey and Hueneme canyon; then again from Coronado to Santa Cruz canyon, and from Catalina to San Clemente rift valley. In each of these cases there is a discontinuity in geography, or in kind of sediment.

The screenings (see ANALYSES) resulting after the removal of fine silt from a sample, when washed through screens of varying mesh-sizes aboard ship, give an approximate idea of some of the physical aspects, especially the kinds of dead and non-living fractions in a given volume of sea bottom. Some samples from all of the longshore canyons have yielded a variety of screened fractions excluding

animals; they are more completely characterized at the ends of the separate analyses, by canyon, station and depth data. Most of the samples have yielded mud in greatest abundance. This passed through the screens with ease when silty, and with difficulty when sticky. The northern long-shore canyons contained a conspicuous amount of consolidated mud balls or fecal pellets of sizes retained by the finest (about a mm mesh) screen. Some of the other inert fractions consisted of gravels, especially coming from some axes depths; woody and fibrous plant debris, possibly originating from the runoff of rivers; algal detritus, possibly from slumping of huge chunks of sediments to lower levels; and dead remains of animals, such as mollusk shells, squid beaks, fish otoliths, spicules of echinoderms and siliceous sponges.

(1) Monterey canyon, at 410 meters, showed considerable dead shells of *Dentalium* (a scaphopod) and *Amphissa* (snail), whereas in 750 and 906 meters much woody debris was correlated with low biological productivity, suggesting an upset condition, perhaps the result of seawater dilution.

(2) Hueneme canyon had considerable flocculent debris and dead *Phyllospadix,* a grass, in 98 meters, flocculent debris and gravel in 271 and 456 meters, and dead *Dentalium* and *Amphissa* shells in 478 and 621 meters.

(3) Mugu canyon had shelly debris and dead sticks prominent in 378 meters, and flocculent debris in 676 meters.

(4) Dume canyon had blackened shells in 638, and blackened plant debris in 711 meters.

(5) Santa Monica canyon contained flocculent debris in 116 and 183 m, dead scaphopods (*Dentalium*) in 330 m and brown waxy lumps in 463 m.

(6) Redondo canyon, in axes depths, had black shelly sand with odor of hydrogen sulfide in 137 and 148 m; plant and woody debris in 298 m, and very coarse sand in 560 m; woody debris was encountered also in 715 m, or fan depths.

(7) The San Pedro sea valley had blackened tubes and waxy lumps with plant debris in 661 m, or its lower end.

(8) Newport canyon had woody debris in its shallowest, 16 m depth, much biological detritus in 36 and 97 m, and flocculent debris in 478 m.

(9) The San Diego trench, sampled only in its northern end where bottoms were fairly uniform as to depth and sediment, consistently contained only biological remains such as siliceous sponge spicules, dead foraminiferans, dead mollusk shells and other animals.

(10) La Jolla canyon contained the same kind of screenings as the more southern Coronado canyon. At 79 and 976 meters, there was fibrous debris; woody debris occurred in 371 and 637 m, plant debris in 135, 274 and 517 meters. In its shallowest axes depths, the animals were chiefly those characteristic of lowered salinity. At its middepths the animals were those found at shelf depths, accompanied by much detritus; at its lowest depths, the animals were those of an abyssal fauna.

(11) The Coronado canyon had dead shells in 177 and 344 m, and flocculent debris in 566 m.

In summary, therefore, all of the long-shore canyons are characterized by the presence of terrestrial debris or materials of noncanyon origin.

In contrast, the offshore canyons failed to show the presence of detritus and woody debris as a screened residual.

(12) The Santa Cruz canyon yielded pitchy lumps, in 676 m.

(13) Catalina canyon yielded broken shells and blackened wood in its shallowest or 88 m depth.

(14) San Clemente rift valley had a hard, impenetrable bottom and produced little in the way of samples or sediment.

(15) Tanner canyon yielded biological debris, especially squid beaks, conspicuous in 298 and 603 meters.

Rocky bottoms were infrequent except in San Clemente, where almost the entire canyon was rocky. In Santa Cruz canyon rocky bottoms were encountered in 218 and 221 m. Samples coming from these bottoms were generally unsatisfactory for quantitative analyses.

## MONTEREY CANYON

This canyon is located far north of the others and was sampled only during one cruise, when a few stations were made. It is included in this series because there are interesting similarities in its benthic fauna with that farther south. Biomass values are highest in 410 meters, at 255 grams per sample, and 260 m with 224 gm per sample; they are lowest in 750 m with only 3 gm per sample. In 168 meters

the sediments are dark gray silt and support chiefly large individuals of a bamboo-worm, *Asychis disparidentata,* a large enteropneust and a capitellid, *Heteromastus filobranchus.* In 260 m, in dark gray silt, the largest animals are an echiuroid, *Arhynchite* sp. with 23 specimens, 4 large echinoids, *Brisaster townsendi,* and smaller animals of many kinds of polychaetes, crustaceans, mollusks, ophiuroids and sipunculids. In 410 meters, in olive green silt with many dead shells of *Dentalium* and *Amphissa,* the largest individuals are *Arhynchite* and *Brisaster,* accompanied by many kinds of polychaetes, some mollusks and sipunculids. In 750 meters, in coarse gray sand, the screenings contain much woody and flocculent debris; the animals are small and of few kinds, including amphipods and cumaceans in large numbers, and polychaetes of the genera *Capitella* and *Nephtys,* with little else.

## HUENEME CANYON

This canyon (see Fig. 2) was sampled in depths of 98 to 621 meters, from axis and walls. Size of samples varied from a low of 1.29 to a high of 5.16 cuft. The sediments were gray, green or black mud and silty gray sand, ranging to coarse gray sand with mud, olive green silty sand, and gray muddy sand with pebbles or gravel.

In the shallowest sampled depth, at 98 m, the bottom axis sediments are coarse gray sand with flocculent debris and black algal strands. Numbers of animal species run high and specimens are moderately small, with none conspicuous. In 165 meters the sediments are gray sand with tubes of *Pectinaria.* The largest animal is *Glycera americana,* associated with high numbers of *Haploscoloplos elongatus.* In 177 m the bottom sediments are green to black medium sand; they support the tubicolous *Asychis disparidentata* and burrowing worms, chiefly *Listriolobus pelodes* and *Heteromastus filobranchus.* This depth supports the largest number of species (38) and specimens (677) recorded in Hueneme canyon.

The most conspicuous kinds of animals in muds in shallow (to 200 m) depths are worms: *Heteromastus filobranchus, Asychis, Glycera, Travisia, Pista disjuncta, Listriolobus* and *Cerebratulus,* all selecting silty mud. *Haploscoloplos* and *Pectinaria* are most abundant in sandier sediments. In greater (373 to 478 m) depths large brissopsid echinoids, first *Brisaster,* then *Brissopsis,* occur with a scaphopod mollusk, *Dentalium rectius,* two clams, *Yoldia scissurata* and *Cyathodonta pedroana,* together with tubicolous polychaetes *Nothria*

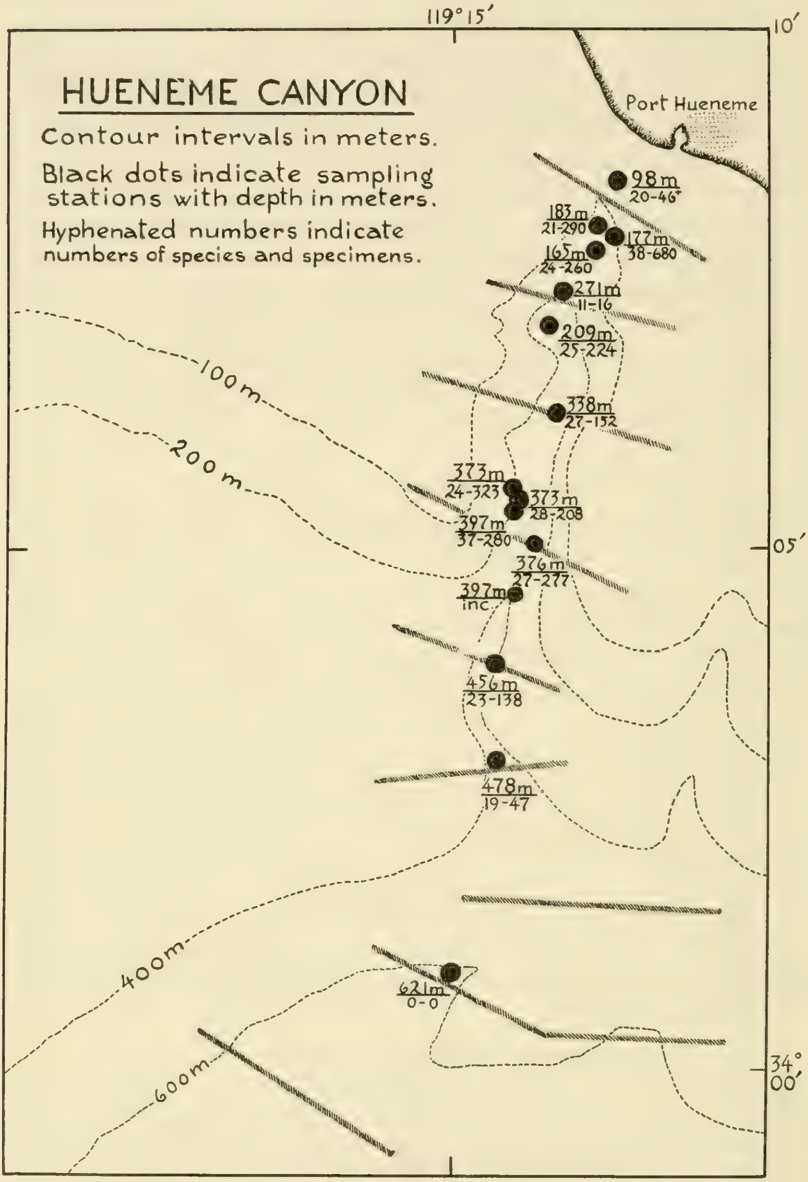



Fig. 2. Hueneme canyon, with contour intervals in meters. Black dots indicate sampling stations with depth in meters. Hyphenated numbers indicate numbers of species and specimens.

*pallida, Onuphis vexillaria, Spiophanes fimbriata,* a thalassemid echiuroid, *Arhynchite,* or *Nephtys* and *Pectinaria,* the last two where sediments are sandy. A sample from 456 m, in gray mud with sand, pebbles and some gravel, had significant numbers of *Capitella,* an indicator of upset salinity conditions, and the deepest sample, in 621 m, in gray sand, is impoverished or nearly dead.

The numbers of species and specimens from shallowest to deepest parts show variation, but the change in values may express differences due to kinds of sediments, with mud having generally the highest, and sand to gravel the lowest values. At greatest depths the sediments are increasingly silty and contain conspicuous amounts of black, oval fecal pellets, chiefly those of *Heteromastus filobranchus* (see Emery and Hülsemann, 1962, p. 170). The large burrowing echiuroid worm, *Arhynchite* sp., is most abundant and largest in 373 and 376 m; it exists in sediments having many fecal pellets which are cylindrical and slightly annular, differing in these respects from those of *Heteromastus,* which are elongate oval.

Tubicolous worms in Hueneme canyon include (1) *Pectinaria californiensis,* inhabiting a slender, cone-shaped tube, and most concentrated in depths of 338 to 376 m, where individuals number to 200 in a sample; (2) *Nothria iridescens* inhabiting a clay-covered, cylindrical tube and attaining highest numbers in 376 and 397 meters; (3) *Nothria pallida* constructing a muddy (to sticky mud) tube and attaining peak numbers in 209 and 373 m; (4) *Onuphis vexillaria* occupying a similar but larger tube and most abundant at 373 m. Onuphid tubes are internally lined with a white chitinized layer and thus distinguishable from those of (5) *Pista disjuncta,* which is most frequent in depths of 209 and 383 m. (6) *Spiophanes fimbriata* attains peak numbers in 576 m; it inhabits a thin-walled, copper-colored, silt-covered tube.

The brackish capitellid, *Capitella capitata* subspp., was found in concentration at only one depth, 456 m, in sediments of sand, mud, pebbles and gravel.

Brissopsid urchins, chiefly *Brisaster townsendi,* are first present at 209 m; they increase in size and number at 383 m to 9 specimens per sample, weighing 217.5 grams, and again at 478 m, where 6 weigh 126 grams. A large shelled clam, *Cyathodonta pedroana,* comprises the bulk of the weight, in 271 and 228 m. At its lowest

sampled depth, Hueneme canyon is impoverished to dead, as is the Santa Monica basin which it joins.

## MUGU CANYON

In its shallowest end at 119 m, Mugu canyon (see Fig. 3) supports a fauna consisting of shelf species. Most conspicuous is an

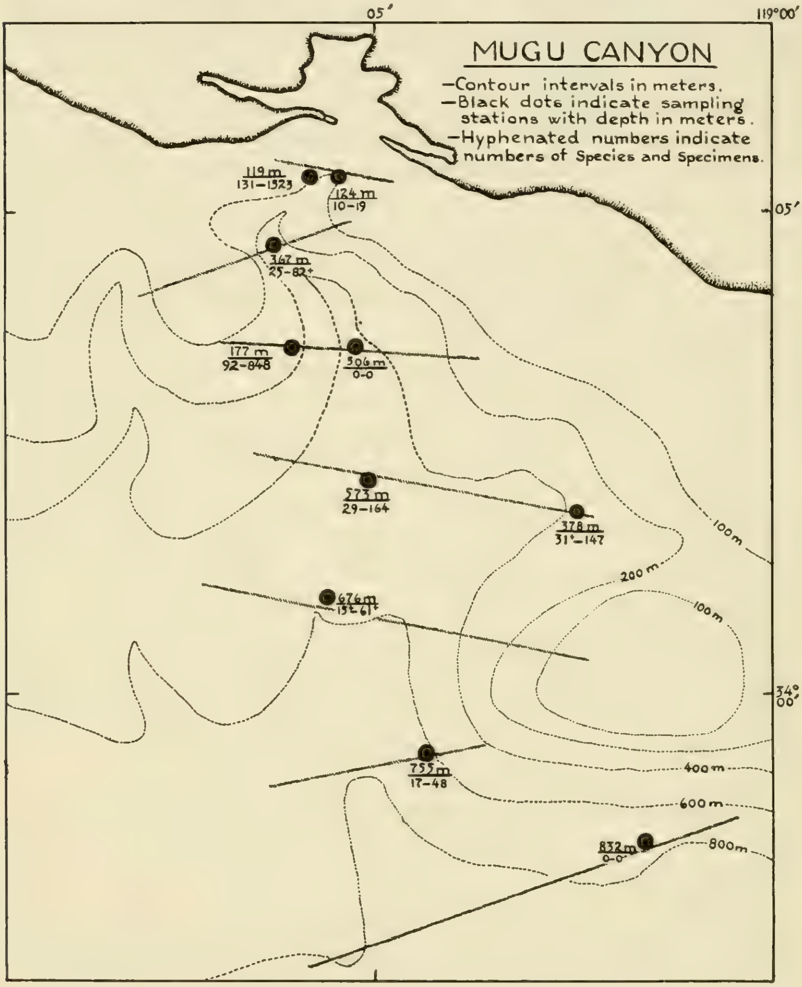



Fig. 3. Mugu canyon, with contour intervals in meters. Black dots indicate sampling stations with depth in meters. Hyphenated numbers indicate numbers of species and specimens.

onuphid, *Diopatra ornata,* which constructs coarse tubes in algal clumps. Nearly all of the 130 species named at this depth are sparse or absent at greater depths. Many of the species are represented by single or few specimens, suggesting that they have their greater concentrations at higher levels or in different ecological situations. A few, chief of which are *Tharyx tesselata* with 71 specimens, *Prionospio malmgreni* with 34, *Typosyllis* sp. with 24, *Magelona sacculata* with 21, *M. pacifica* with 7, and *Lumbrineris* spp., attain high frequency in a sample. A small anemone, ?*Harenactis* sp., with 10, and a brachiopod, *Glottidia albida* with 41 specimens, are members of the shelf fauna, as are some small mollusks and many amphipods (see ANALYSES).

An abrupt faunal change occurs at about 177 meters, where are found *Maldane sarsi* with 58 specimens, *Owenia f. collaris* with 58, *Chloeia pinnata* with 39, *Rhodine bitorquata* with 31, and *Axiothella rubrocincta* with 18 specimens in a sample. Onuphids are represented by *Onuphis parva* with 22 and *Nothria iridescens* with 25 specimens.

The capitellid, *Heteromastus filobranchus,* and an echiuroid, *Arhynchite* sp., never attain the abundance found in Hueneme canyon, but occur most abundantly in depths of 573 and 367 meters.

From 676 meters down, a deepwater fauna exists; it includes a small capitellid, *Decamastus gracilis,* an ampharetid, *Anobothrus* sp., a lumbrinerid, *Lumbrineris longensis,* a glycerid, *Glycera c. branchiopoda,* an orbiniid, *Califia calida,* a flabelligerid, *Brada pilosa,* a spionid, *Spiophanes pallidus,* and few other species (see ANALYSES).

An ophiuroid, *Amphiodia urtica,* attains only moderate abundance, in 378 meters with 28 specimens, where it occurs with *Chloeia pinnata.* Brissopsid urchins exist from 177 m down but are nowhere conspicuous. In its lowermost levels, at 832 meters, Mugu canyon is impoverished or dead, like Santa Monica basin with which it merges.

## DUME CANYON

This canyon (Fig. 4) was sampled in depths from 100 m down. One sample was trawled at the head of the canyon, Nov. 20, 1958, by the Hyperion Engineers, centered at 33° 58′ 45′, 118° 46′ 50″, in 100 to 110 meters. It contained a large shale-rock pitted at the surface. Its exposed surface was nearly covered with serpulid tubes, chiefly *Vermiliopsis* spp., and the pitted holes resembled those of pholad mollusks and contained nestling ophiuroids, small seastars, a

white holothurian, various polychaetes and other smaller animals. A large white anemone, ?*Metridium* sp., a large red nemertean with white transverse bars and other animals, are partly analyzed:

Polychaetes include *Apomatus* sp., in white cylindrical tube on rocky surface; *Euphrosine* sp., in crevice of a rock; *Flabelligera in-*

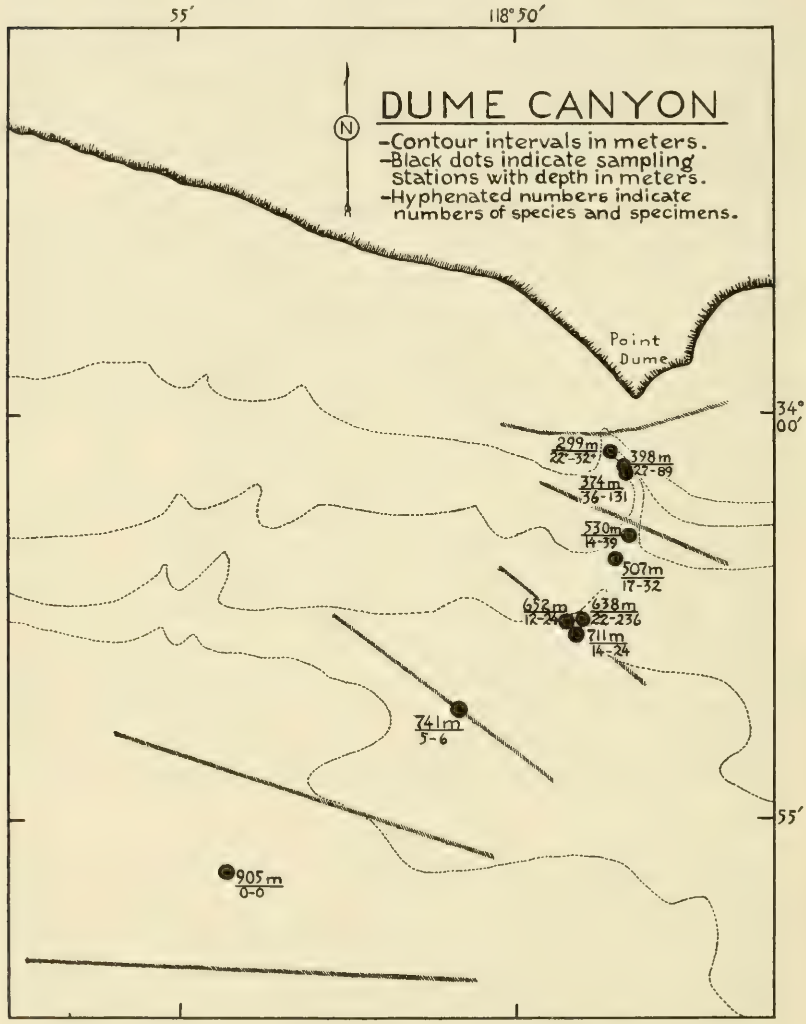



Fig. 4. Dume canyon, contour intervals in meters. Black dots indicate sampling stations. Hyphenated numbers indicate numbers of species and specimens.

*fundibularis,* in a thick mucus sheath; *Glycera capitata,* in silt surrounding the rock; *Hypsicomus californicus,* in cartilaginous tube penetrating a rock; *Laeospira* sp., in sinistrally coiled tubes on rock surface; *Lepidonotus caelorus,* in crevices in rock; *Lumbriclymene* sp., abundant in drillings in rock; *Peisidice aspera,* abundant in rocky crevices; *Nicomache* sp., nestling in arenaceous tubes in pits of rock; *Pherusa inflata,* in U-shaped burrows in rock; *Phyllochaetopterus prolifica,* in slender, irregular, opaque tubes; *Pista elongata,* in long, slender tube with reticulated top; *Platynereis bicanaliculata,* in mucoid tube; *Polycirrus* sp., nestling in crevices in rock; polydorid, in U-shaped drillings in rock; *Pseudopotamilla* sp., in cartilaginous tube penetrating rock; spirorbids, in transparent tube attached to rock surface; *Vermiliopsis ?infundibulum,* attached to rock; *Vermiliopsis ?cornuta,* attached to rock.

Echinoderms include *Amphipholis pugetana; Amphipholis squamata; Ophiacantha diplasia; Ophiopholis bakeri; Ophiura lütkeni; Mediaster aequalis; Rathbunaster californicus; Sclerasterias heteropaes; Cucumaria crax; Psolus* sp., holothurians, of several kinds.

Mollusks include chitons, many small; gastropods, numerous small, of several kinds; *Saxicavella pacifica*; small white slug.

These animals are members of a rock-bottom fauna, in shallow to moderate depths.

The shallowest quantitative sample from Dume canyon in 299 meters contained chiefly single individuals of deep water or shelf species, some of which have their greater concentrations below or above this level. Brissopsid urchins are prominent at 652 meters, and tubicolous worms, especially *Nothria pallida* and *Pista disjuncta,* continue prominent to 507 meters, after which they are replaced by *Melinnexis* and *Califia* species. A ghost shrimp exists at 570 and 741 meters. A clam, *Compsomyax subdiaphana,* is present with many small individuals at 580 meters.

## SANTA MONICA CANYON

This canyon (Fig. 5) was sampled in 80 to 873 meters. A sample trawled at the head of the canyon, Nov. 30, 1958, by the Hyperion Engineers, centered at 33° 56′ 40″, 118° 34′ 00″, along the 80 meter contour, yielded rock specimens and many animals, some of which are named:

Polychaetes include *Cirratulus cirratus; Eulalia* sp., dorsum with 3 longitudinal rows of spots; *Eunice multipectinata,* in mucoid, parch-

ment-like tube, irregularly occupying crevices of rock; *Hypoeulalia,* nr *bilineata,* deep yellow in life; *Isocirrus* sp.; *Lepidonotus caelorus; Lumbrineris inflata; Marphysa conferta; Nicomache personata; Peisidice aspera; Phyllochaetopterus prolifica; Pherusa inflata; Pherusa papillata; Sabellaria cementarium,* in arenaceous tubes attached to rock; *Typosyllis,* nr *hyalina; Vermiliopsis* spp., attached to rocky surfaces.

In addition, *Scalpellum,* a stalked barnacle, amphipods, branching

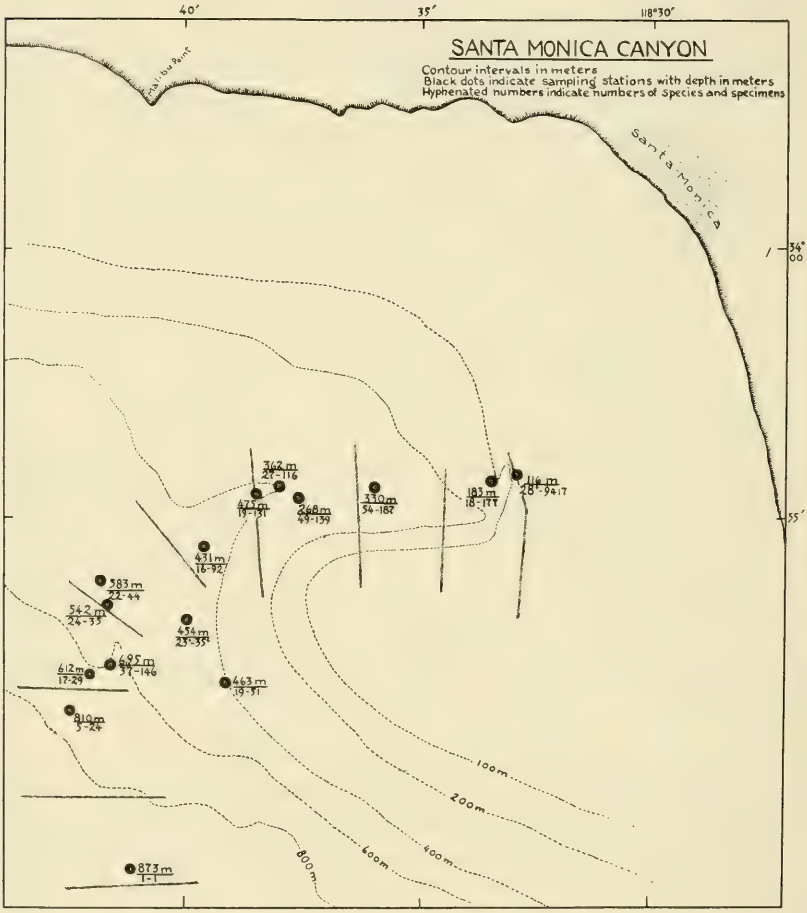



Fig. 5. Santa Monica canyon, contour intervals in meters. Black dots indicate sampling stations with depth in meters. Hyphenated numbers indicate numbers of species and specimens.

hydroids, ophiuroids, nestling mollusks and a few other species comprised the population; this is a rock bottom fauna.

Another sample trawled Oct. 31, 1958, at the head of Santa Monica canyon, 7 miles from shore, centered at 33° 54′ 00″, 118° 36′ 00″ in about 200 meters, yielded large boulders of which the exposed surfaces were sparsely covered with animals, including branching hydroids and small colonies of encrusting bryozoans. A large cherty boulder was riddled by holes of a boring clam, *Saxicava arctica*. Small chitons and nestling maldanids occupied the depressions and silt-covered pockets of the rock.

Polychaetes include *Aricidea* sp.; *Dodecaceria* sp., small but ovigerous individuals; *Eulalia* sp., dorsum yellow, with 3 black spots to each segment; *Eunice multipectinata; Exogone* sp., with long swimming setae; *Drilonereis* sp., drab green with pale prostomium; *Glycera tenuis; Lumbrineris index; Notoproctus pacificus,* in arenaceous, fragile tube; *Nicomache personata,* large red, in arenaceous tubes in rocky depressions; *Oncoscolex pacificus; Pherusa papillata; Peisidice aspera; Lepidonotus caelorus; Lagisca multisetosa;* harmothoid polynoids; *Sphaerodorum papillifer;* protulid tube, cylindrical, smooth, fully attached to rock.

Echinoderms include *Allocentrotus fragilis; Ophiopholis bakeri; Ophiura lütkeni; Ophionereis eurybrachyplax; Ophiodesmus amphilogus.*

Mollusks include small chitons; small gastropods; *Saxicava arctica.*

In addition, there were also a sipunculid, articulate brachiopods, solitary corals, amphipods, a gnathid isopod, encrusting bryozoans. This is a rocky fauna.

In Santa Monica canyon, the shallowest grab samples, in 116 and 183 meters, came from axes depths and yielded animals limited to *Capitella capitata* subspp. and *Dorvillea articulata,* both indicating a disturbed or lowered salinity condition. At 268 meters an abrupt faunal change is indicated by the large numbers of shelf species. At 330 to 479 meters the presence of high numbers of *Maldane sarsi* indicates a change from sandy to silt bottom. An *Onuphis vexillaria* association is best represented in depths of 454 to 583 meters; this is replaced in 542 meters and beyond by deepwater species, not occurring in shallower bottoms. The deepest parts of the canyon, from 800 meters down, is nearly or altogether dead, like the basin.

## REDONDO CANYON

Redondo canyon (Fig. 6) is a steep-walled, nearly straight, westerly directed canyon about nine miles long. It intersects the shallow mainland shelf of Santa Monica Bay to near shoreline and extends westward to Santa Monica basin. Depths range from 57 to 853 meters. The sediments of its sampled areas are chiefly fine grained silty, to sticky green or blue or gray mud, except in some axes depths, where gravels and coarse sands occur.

This canyon has proven most interesting, perhaps because it was the most completely sampled. Fifty-six samples come from all depths and parts. It is here recognized for a south wall (shown as shaded circles on the chart), a north wall (clear circles), axis depths (struck circles), basin slope (crossed circles), and fan (circles half shaded). Except in most of its lower or fan extension, where the fauna is impoverished as it is in its adjacent basin, the fauna is diverse, high in standing crop and indicates an availability of food and replenishing larval supplies.

Large samples have usually been recovered using either the smaller orange-peel, or the larger Campbell grab, except in a few cases where closure of the jaws was incomplete. Volumes were thus usually between 2 to 4 cuft. Screenings retained little but living and dead remains of animals, many foraminiferan tests and some mud fractions. Flocculent and other debris came usually only from shallower parts, and some broken shells in a few samples.

Along the *south wall* mud was recovered in all but three samples; one of these had sand and gravel in 76 meters, the other two had flocculent debris in 232 and 519 meters. The shallowest sample had high numbers of a nest-building bivalve, *Amygdalum pallidulum,* and the 232 m sample contained many individuals of two kinds of capitellids, *Heteromastus filobranchus* and *Decamastus gracilis.* At 519 meters there were peak numbers of *Amphissa,* a giant *Scalibregma inflatum,* and other wormlike animals. Peak numbers of an ophiuroid, *Amphipholis pugetana,* came from 542 meters, and *Chloeia pinnata* with *Pholoë glabra* in 57 meters, whereas *Chloeia* with *Pectinaria* characterized the bottom in 378 meters. Largest individuals varied with depth; at 76 m it was a maldanid and a nemertean; at 232 and 378 m an echiuroid, at 519 and 575 m a nemertean, and at 542 m a brissopsid. On the whole, there is a diminution in numbers

of species and specimens with increasing depth, but the most depressed numbers are in 519 m where flocculent debris was conspicuous.

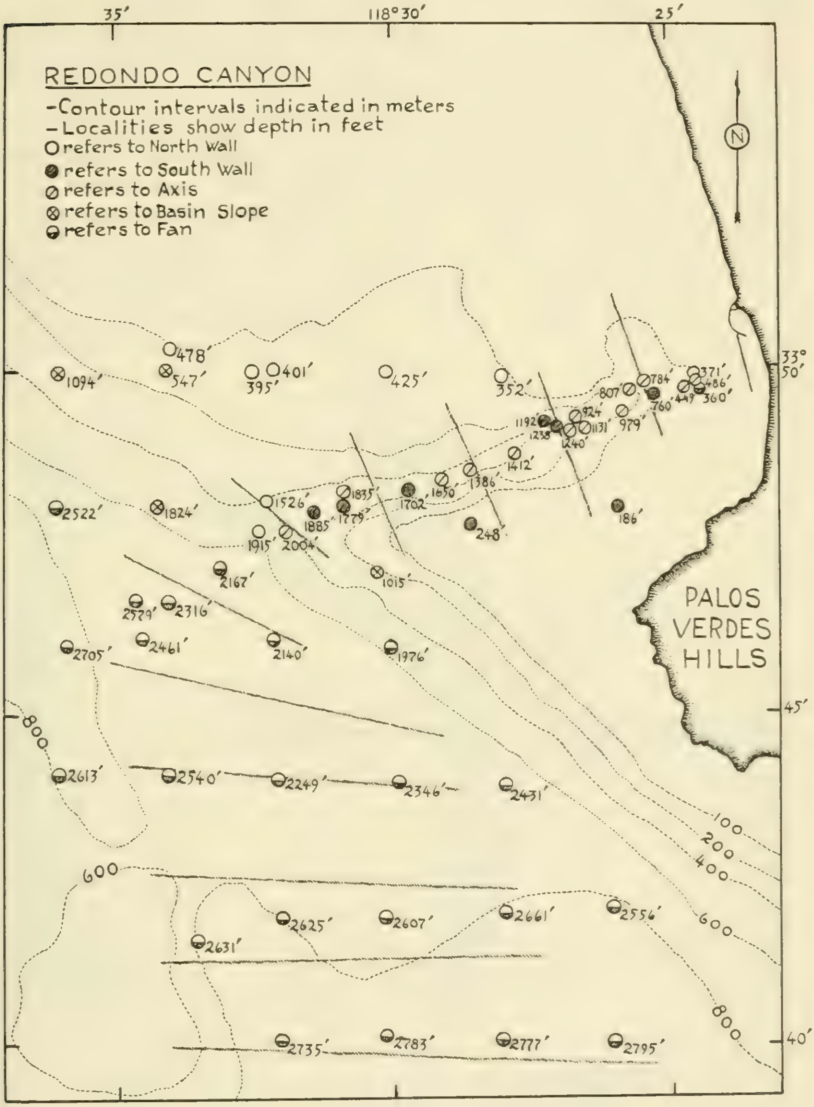



Fig. 6. Redondo canyon. Contour intervals indicated in meters. Localities show depth in feet. The clear circles refer to stations along the north wall, shaded circles to the south wall, struck circles to the axis, crossed circles to the basin slope, and half shaded circles to fan depths.

The *north wall* of Redondo canyon is represented by eight samples coming from depths of 107 to 554 meters. The shallowest contains considerable amounts of gravel and shell fragments mixed with green mud; one in 113 m has sandy mud. Both are characterized by a high diversity of species belonging chiefly to the outer shelf fauna. Polychaetes number 56 species and 524 specimens in the first, and 45 species with 609 specimens in the second, of which nearly half were not present in the first sample. A commensal hydroid, *Monobrachium parasitum,* is frequent on shells of a small clam, *Axinopsida,* and a small sipunculid, possibly *Golfingia* sp., (see Fig. 7) in *Rhabdamina,* an arenaceous foraminiferan, both in shallowest sandy sediments at depths of 107 and 120 meters. Ophiuroids, *Amphiodia urtica* and *A. digitata* exist in peak numbers in shallowest parts, together with

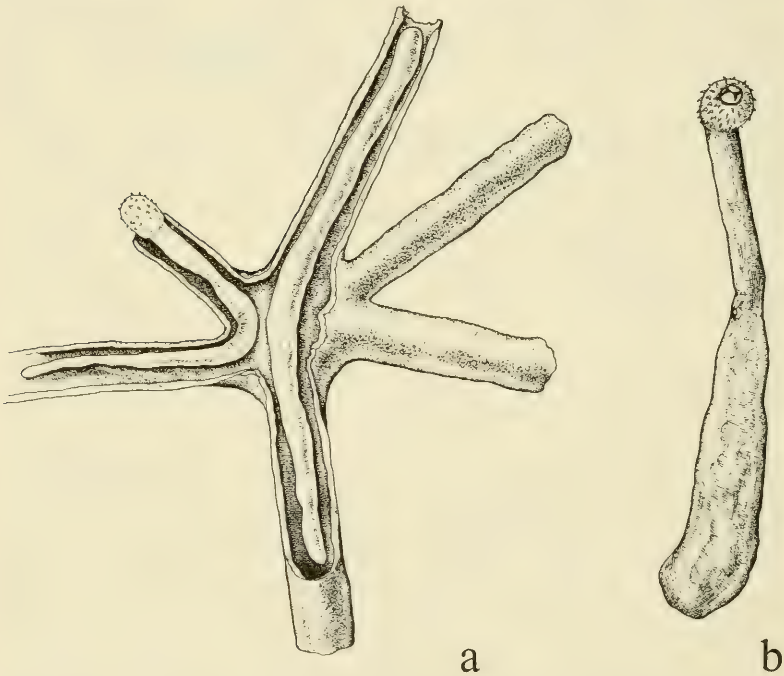



Fig. 7. ?*Golfingia* sp., a sipunculid, penetrating *Rhabdamina,* a foraminiferan, from the upper end of Santa Monica canyon. *a.* the *Rhabdamina* partly broken open to show two sipunculids in place. *b.* a single sipunculid, removed from the host, showing distal end of introvert with oral lobes and subterminal spines, and anal pore, x 17.

*Pectinaria californiensis, Pholoë glabra* and *Prionospio* spp. Most of the members of this assemblage occur also in shelf depths throughout the Santa Monica Bay area. The green shelf echiuroid, *Listriolobus pelodes,* is replaced by the canyon one, the red *Arhynchite* sp., in 146 meters, and a green mud fauna occurs at 560 to 611 meters.

The axis was sampled in depths of 137 to 611 meters; its sediments are mostly mud or sand. In its shallowest depths the sediments are black, have an odor of hydrogen sulfide and contain dead shelly debris. The larger animals are the cone-tube worm, *Pectinaria,* the stinging worm, *Chloeia pinnata,* and numerous smaller shelf species of polychaetes. The capitellid, *Heteromastus filobranchus,* is abundant throughout much of the canyon from 148 to 560 meters, and accounts for the abundance of fecal pellets (see Emery and Hülsemann, 1962) found in the sediments. Brissopsid urchins are mainly *Brisaster townsendi,* in 378 to 611 meters. A large red ribbon nemertean, *Cerebratulus,* is taken singly in most samples from axes depths. The largest polychaetes are *Onuphis vexillaria, Lumbrineris index. Aphrodita* sp. and *Glycera americana. Brada pilosa,* a bristle-cage worm, attains high concentrations in depths of 503 and 560 meters. The large red echiuroid, *Arhynchite* sp., is generally encountered in large samples from muddy sediments. The samples from greatest depth contain representatives of deepwater species, resembling those of more northern canyons.

The brackish capitellid, *Capitella capitata* subspp., is most abundant at 148 meters. Black mud and oil globules with some animals are taken in 246 and 282 meters. Plant and woody debris, dead and broken tubes of *Pectinaria* are most abundant at 298 and 344 meters. Notably sparse or absent are representatives of amphiodid ophiuroids, the green *Listriolobus,* crustaceans especially amphipods, surface forms such as sea whips, ceriantharians, and many more.

The *basin slope* was sampled in 167 to 556 meters. The samples contain gray mud, sand, stones, shelly rubble and waxy lumps from shallowest parts, and sandy or silty mud with many animals and foraminiferan remains in 310 to 556 meters.

The *fan* was sampled in depths from 602 to 853 meters, here considered in three groups: 602 to 751 meters, 769 to 800 m, and 808 to 853 m. The first group, with eight samples, has a considerable amount of specific diversity, the second group has far less, and the third group is nearly without life. At 602 meters a small sea pen,

solenogasters and a white snail, *Mitrella permodesta,* and numerous polychaetes occur. Echinoderms are represented by *Asteronyx loveni* and *Ophiomusium jolliensis,* and crustaceans are nearly absent. Woody fragments are encountered in 715 meters, with *Cadulus tolmiei,* a scaphopod, *Mitrella,* and a small white enteropneust with subspherical proboscis. Other animals, to depths of 786 meters are *Brissopsis pacifica* and *Brisaster townsendi,* siliceous sponge, polychaetes, mainly *Phyllochaetopterus limicolus* and *Protis pacifica,* together with dead shells of *Cyclopecten.* There is no life below 825 meters.

## SAN PEDRO SEA VALLEY

This canyon (Fig. 8) is represented by 13 grab and 2 dredged samples. Volumes of grab samples ranged from a low of 0.7 cuft in 461 m, to 5.74 cuft in 187 m. Depths ranged from 187 to 740 m, with dredged samples coming from 100-300 to 240-280 meters.

Highest biomass values were measured in 319 m, and values were high in all depths except at 406 and from 661 m downward, where impoverished conditions exist. In all samples the polychaetes comprised the greatest bulk and highest numbers of kinds of specimens. Combining all samples the following kinds of animals are represented: polychaetes with 145 species; echinoderms with 17 species; mollusks with 25 or more species; crustaceans with 11+ species; other kinds with 15+ species, or in all more than 220 species.

As in other canyons, the change of specific groups with increasing depth is conspicuous. About 91 species of polychaetes occur in depths to 221 m. Most of them have their maximal numbers and sizes in these ranges. Only a few, such as *Chloeia pinnata* and *Maldane sarsi,* attain their maximum development at greater depths, except for some of the typical deepwater forms below 400 meters.

*Heteromastus filobranchus* is inconspicuous in this canyon; its greatest concentration is at 406 m, but nowhere has it the abundance found in the northern canyons. *Capitella capitata* subspp. are not abundant in any of the samples, but concentrations have been earlier reported in adjacent areas (see Hartman, 1955, p. 81); it is possible that an area of concentration does exist in an axis depth, but that it was not located in the survey.

Peak occurrences of a few species are noteworthy; they include *Spiophanes fimbriata, Myriochele gracilis, Sthenelanella uniformis* and *Chloeia pinnata,* all in 221 meters. Deepwater species are restricted to

depths below 400 meters and resemble those found in other longshore canyons.

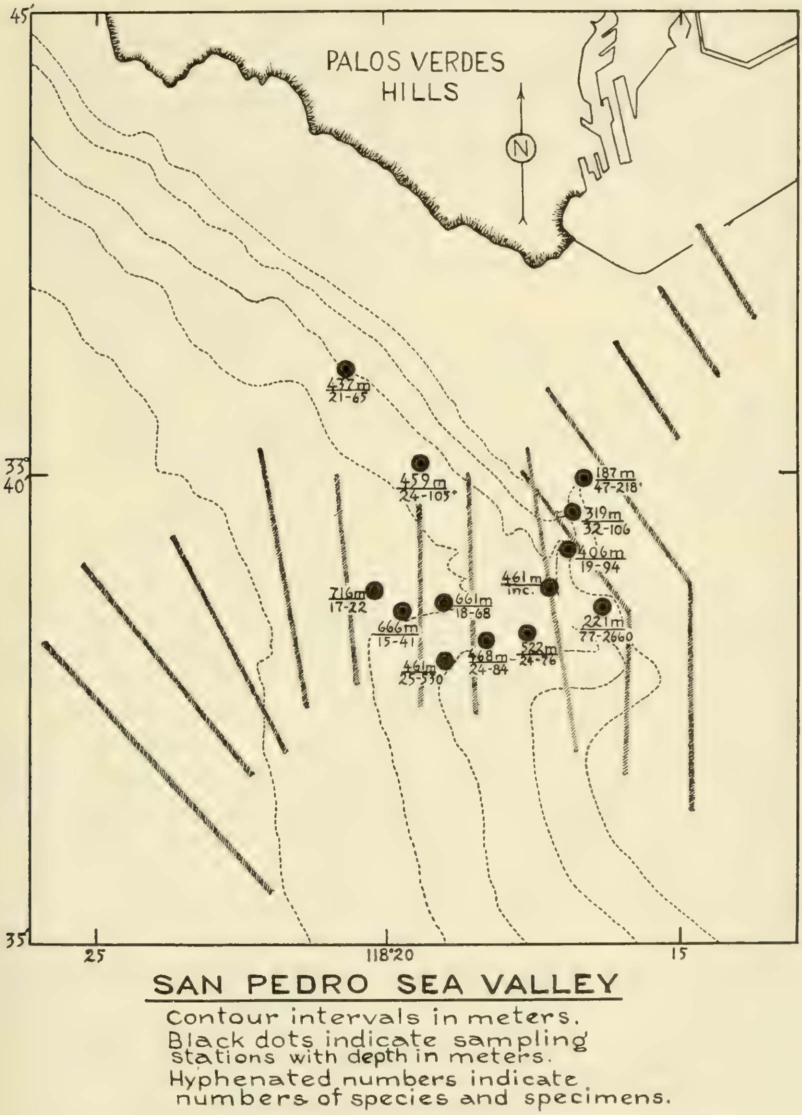



Fig. 8. San Pedro sea valley with contour intervals in meters. Black dots indicate sampling stations with depth in meters. Hyphenated numbers indicate numbers of species and specimens.

A dredged sample from 100-300 meters, sta. 7175-60, centered at 33° 39′ 34″, 118° 18′ 12″, yielded about 4.5 cuft of green silt, sand, a long boulder about 1 x 2 ft, and gray-brown layered shalestone. The largest animals are *Travisia pupa,* and the most abundant are *Chloeia pinnata, Goniada brunnea, Lumbrineris* spp., *Sthenelanella uniformis, Nothria iridescens* and other kinds of polychaetes. There are sparse numbers of nemerteans, echiuroids, amphipods, sipunculids, some solenogaster mollusks and no visible echinoderms. In all 48 kinds of polychaetes are named (see ANALYSES); they could be distinguished as having come from mud, from sand and mixed bottoms—a result of using a dredge over an area known to have closely patterned sediments.

Another dredged sample, sta. 7161-60, at 33° 37′ 50″, 118° 16′ 44″ to 33° 37′ 27″, 118° 16′ 18″ in 240-280 meters, yielded about 4 cuft of green sandy silt with many animals, of which the most conspicuous were echinoderms. Largest individuals are brissopsid echinoderms, a cancroid crab, *Leptosynapta albicans,* and tremendous numbers of *Chloeia pinnata,* with large *Goniada brunnea.*

## NEWPORT CANYON

Thirteen samples (Fig. 9) were taken in 16 to 642 meters. In its shallowest part this canyon contains a considerable amount of woody debris and other biological detritus. At 16 m commensal pinnotherid crabs are unusually abundant, together with many different kinds of small polychaetes, chiefly cirratulids, spionids and *Haploscoloplos elongatus.* At 37 meters the largest animals are an enteropneust, *Schizocardium* sp., and *Glycera* spp., with many smaller polychaetes, chiefly cirratulids and spionids. At greater depths in less than 100 m, sediments are silty and support diversified kinds of animals, mainly polychaetes. At greatest diversity there are 110 species and 611 specimens in a sample, of which the most conspicuous are *Pectinaria* and *Heteromastus filobranchus.* Biomass values range from 21.5 grams per sample in 140 meters, to 83 grams in 83 meters. Where sediments are somewhat sandy, nephtyids, *Pectinaria* and *Dentalium* thrive. Where they are mud, *Pista disjuncta,* onuphids, large nemerteans and ophiuroids prevail. At about 400 meters the fauna is characterized by the presence of brissopsids, *Arhynchite,* ceriantharian anemones, deep-water polychaetes, and mollusks, especially *Saxicavella* and *Mitrella permodesta.* The deepest sample, in 642 m, yielded a large ophiuroid, *Asteronyx loveni.*

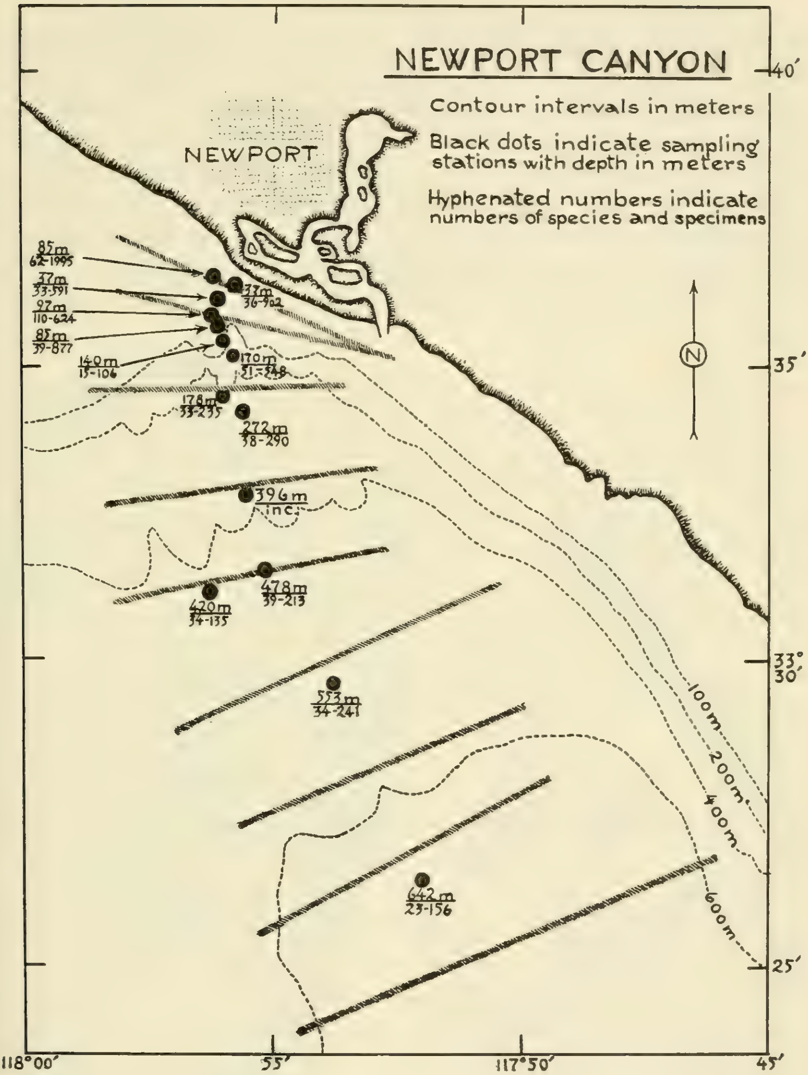



Fig. 9. Newport canyon, with contour intervals in meters. Black dots indicate sampling stations with depth in meters. Hyphenated numbers indicate numbers of species and specimens.

## SAN DIEGO TROUGH, NORTHERN END

This filled-in basin has some of the characteristics of a trench because its bottom areas contain living animals. It is included here because it was not evaluated in the basin report (Hartman and Barnard, 1960). Six samples, from 343 to 423 meters, yielded animals at all depths. Biomasses are low, ranging from 3.7 to 0.5 grams per sample. Most animal species occur as single individuals, but some are grouped, notably *Myriochele,* a polychaete, best represented at 420 to 422 meters, and *Amphiura seminuda,* an ophiuroid, in 420 meters. Most of the species are those found in shallow to deep parts of the long-shore canyons.

## LA JOLLA CANYON

Eleven samples (see Fig. 10) come from 79 to 976 meters; sample sizes range from 0.26 to 5.74 cuft and all were taken with the Campbell grab. Biomasses range from negligible, coming from the largest or third deepest sample, up to 81.8 grams from a moderately large sample in 121 meters. Largest individuals in shallow, 79 to 121 m, depths are *Cerebratulus,* a nemertean, *Aphrodita, Asychis* and other polychaetes. In deeper, 545 and 637 m depths, the largest are *Brissopsis* and *Arhynchite.*

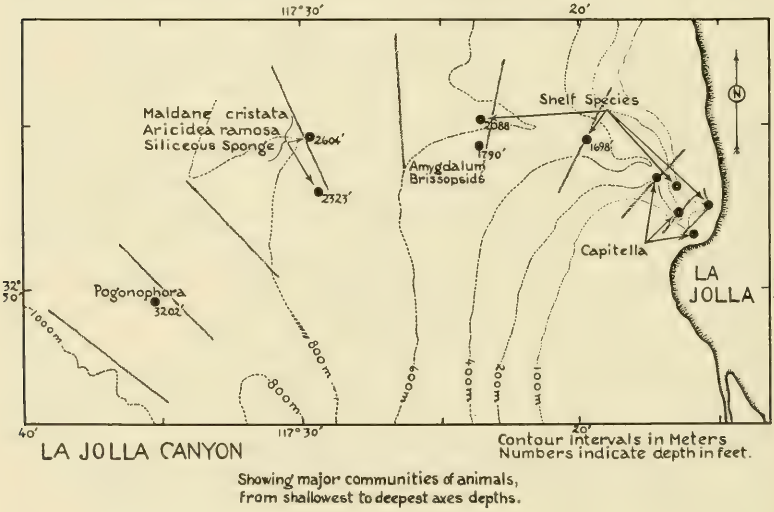



Fig. 10. La Jolla canyon, with contour intervals in meters. Numbers indicate depth in feet. The major communities of organisms are shown, from shallowest to deepest axes depths.

A diversified shelf fauna exists in 79 and 121 meters, as well as in shelf depths with algal debris farther from shore. Some species attain peak numbers; such are *Aricidea lopezi* with more than 310 individuals per sample in 79 m, *Ancistrosyllis tentaculata* with 69 and *Cossura candida* with 86 in a sample.

Axis depths, in 135 to 371 meters, have sediments of sand and pebbles; animals are almost entirely *Capitella capitata* subspp. in tremendous numbers, with 14,145 individuals counted in a sample from 274 m (Hartman, 1961, p. 333); some harbor an endoparasitic copepod, *Monstrilla capitellicola* (Fig. 11). At middle depths, in 517

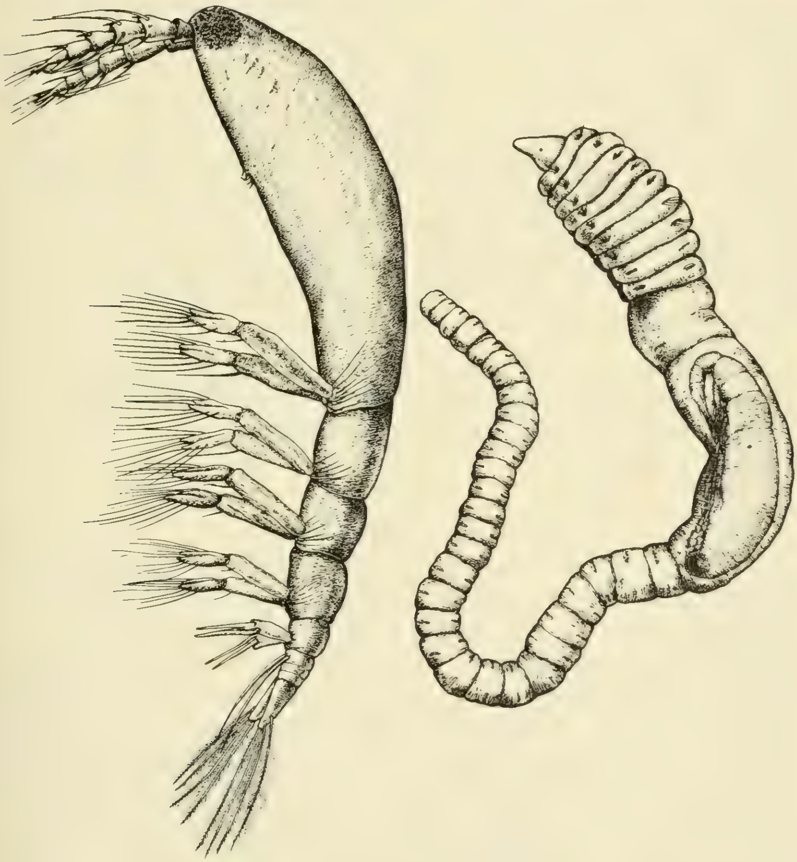


Fig. 11. *Monstrilla capitellicola,* a parasitic copepod, at left side, and a parasite in the host species, *Capitella capitata oculata,* at the right side, greatly enlarged.

and 545 m, the bottom is somewhat impoverished, with numbers of species and specimens reduced. In deeper parts a deepwater fauna exists, characterized by brissopsids, some ophiuroids, *Maldane cristata, Aricidea ramosa;* and in its deepest parts an abyssal fauna is found; this includes pogonophores, *Ophiacantha normani* and some unusual polychaetes. In these respects this canyon shares some characteristics of the next adjacent Coronado canyon (see below).

## CORONADO CANYON

Eight samples (see Fig. 12) taken in 123 to 1265 meters, range in size from 0.6 cuft in 566 m to 5.74 cuft in 344 m. Biomasses range from a low of 2.4 to a high of 105.7 grams per sample. The analyses resulted in the documentation of 101 species and 843 specimens of polychaetes, 13 species of echinoderms, at least 16 mollusks, 15 or more crustaceans, and 9 other kinds of animals, or a total of more than 154 species. Largest individuals are *Ophiura lütkeni, Glycera robusta, Brissopsis pacifica, Melinna heterodonta* and *Asychis* sp. Most abundant in a sample were *Amphiodia urtica,* in 177 m with 107 specimens, and *Spiophanes missionensis* with more than 100, *Brada pilosa* in 566 m with 63 and solenogasters with 44 specimens. *Melinna* numbered 36 specimens in 344 meters.

The shallowest sample, in 123 m, contained chiefly shelf species, and all other samples had either deepwater species or unique kinds. Most unusual were *Siboglinum* and an oligochaete with prickly epithelium at 960 meters.

## SANTA CRUZ CANYON

Nine samples were taken in 89 to 1624 meters (see Fig. 13) with the large grab sampler, and one other in 800 m with the small one. Size of sample varied from 0.26 cuft in the shallowest depth, to 4.16 cuft in the deepest station. Biomasses were highest in 459 meters, where large *Brissopsis pacifica* comprised the bulk. The shallowest bottoms were shelly sand and silt, which support many kinds of small animals, whereas deep bottoms, from 676 m down, are mud. Peak numbers are recorded for an onuphid, where 247 juvenile specimens occurred in 89 meters; small chitons with 34 specimens in a rocky bottom at 218 m; *Tellina carpenteri* with 36 and *Chaetozone* sp. with 244 in 459 meters, and *Leiochrides hemipodus* with 25 specimens in 902 meters.

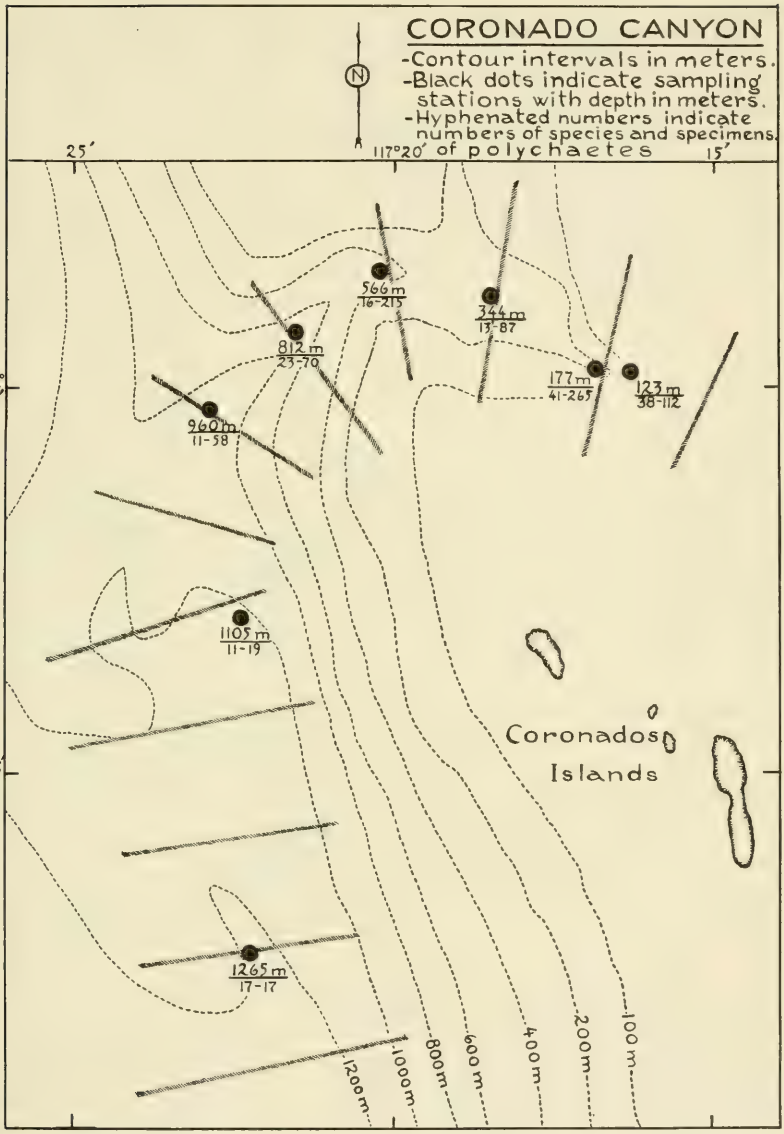



Fig. 12. Coronado canyon, with contour intervals in meters. Black dots indicate sampling stations with depth in meters. Hyphenated numbers indicate numbers of species and specimens of polychaetes.

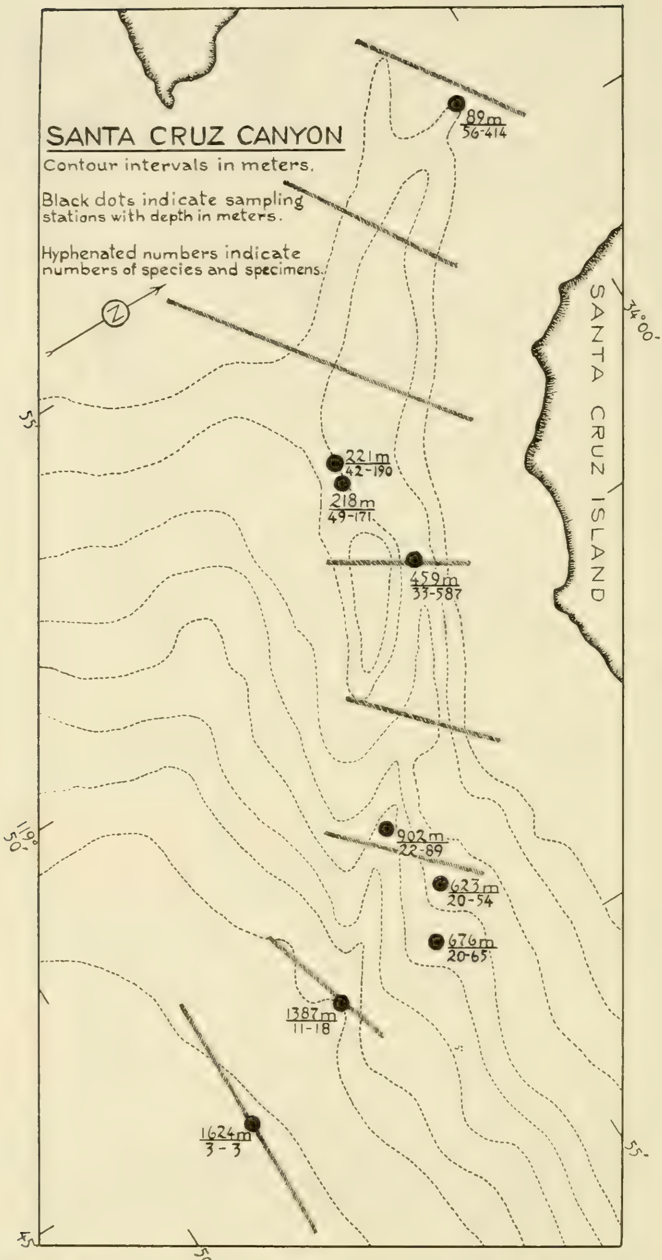



Fig. 13. Santa Cruz canyon, with contour intervals in meters. Black dots indicate sampling stations with depth in meters. Hyphenated numbers indicate numbers of species and specimens.

In this, as in all other canyons, there is a decrease in numbers and kinds with depth. The lowest part is nearly dead and the sediments contain empty tubes of *Phyllochaetopterus limicolus,* as in Santa Monica basin but in sparser numbers, and the dead shell remains are mainly those of *Delectopecten* instead of *Cyclopecten.* Most of the polychaetes recorded are different from those in longshore canyons and the same applies to the kinds of other animals. The Santa Cruz basin (Hartman and Barnard, 1960, p. 274) supports at least 60 species of invertebrate metazoans of which 28 are polychaetes, 6 amphipods, 3 isopods, 4 echinoderms, 6 or more mollusks and 4 are other kinds.

## CATALINA CANYON

Eleven large samples (Fig. 14) come from depths of 88 to 1272 meters and vary in size from 2.44 to 5.52 cuft. Polychaetes ranked highest specifically and numerically. Unusual concentrations included *Anobothrus gracilis* with 565 specimens in 559 meters, *Ammotrypane aulogaster* with 8 in 362 m, *Aricidea,* nr *suecica* with 154 in 914 meters, *Pectinaria californiensis* with 118 in 379 m and *Haploscoloplos elongatus* with 44 at 379 and 559 meters. *Maldane* and *Melinna,* two deepwater genera, were most abundant in 379 meters, and *Califia calida* in 549 and 559 meters.

Among the echinoderms *Amphiodia urtica* with 606 and *Amphipholis squamata* with 105 specimens were most numerous in 88 meters. *Ophiomusium jolliensis* with 13 and *Amphiura diomedeae* with 24 are best represented in 559 meters. Brissopsid urchins are sparse but present. Among the mollusks, *Dacrydium pacificum* with 44 paired shells (some may be dead) are most abundant at 549 meters. Other large individuals include *Molpadia intermedia, Arhynchite,* a nemertean and *Travisia pupa.*

## SAN CLEMENTE RIFT VALLEY

This canyon (Fig. 15) was very imperfectly sampled because its sampled walls are rocky and its axes depths are gravelly. Four samples, all small, yielded less than a cuft of sediment with hard rocks. Animals were sparsely attached to their surfaces. Biomasses are negligible for this reason. The kinds of animals show affinities with those reported from the San Clemente basin (Hartman, 1960, p. 274). The analyses (See APPENDIX) list 21 additional species associated with hard substrata. All are deepwater species, not found in longshore canyons.

## TANNER CANYON

Six samples (Fig. 16) from 298 to 1298 meters were taken with the large grab. Sample sizes varied from a low of 0.14 cuft to the largest, 2.72 cuft from the deepest part of the canyon. Weight of animals was highest, 32.1 grams, in the smallest sample, and low in all others. The screenings of all samples contained considerable amounts of biological debris, especially squid beaks, siliceous sponge, radiolarian fragments, dead mollusk shells, especially those of pectens and *Turcicula,* a large snail, also spines of echinoids and muddy tubes of polychaetes. The smallest sample, from 496 m, contained

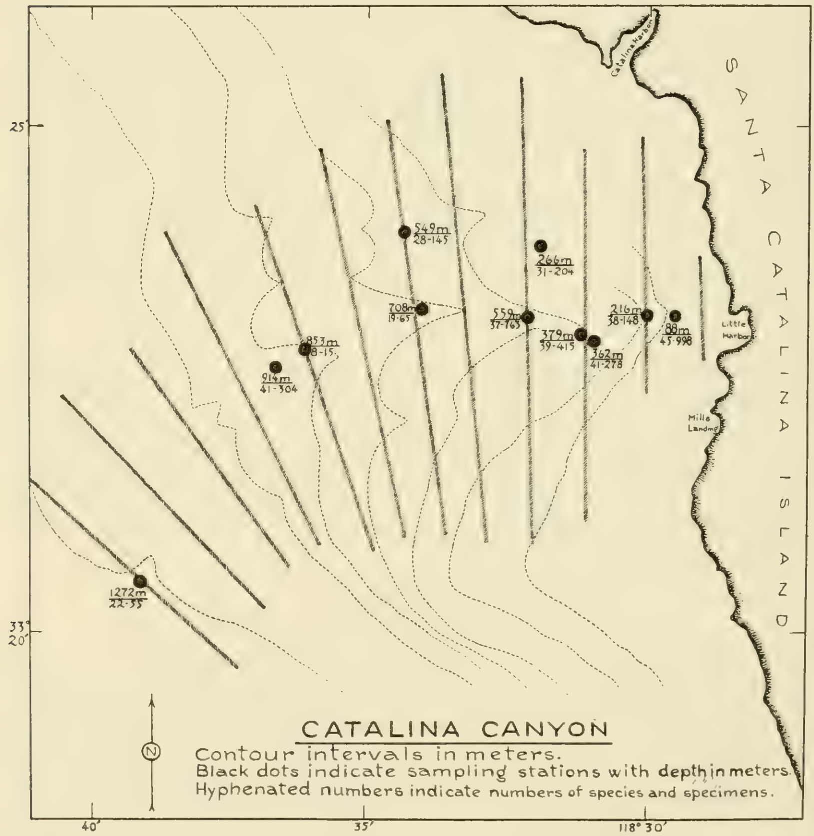



Fig. 14. Catalina canyon, with contour intervals in meters. Black dots indicate sampling stations with depth in meters. Hyphenated numbers indicate numbers of species and specimens.

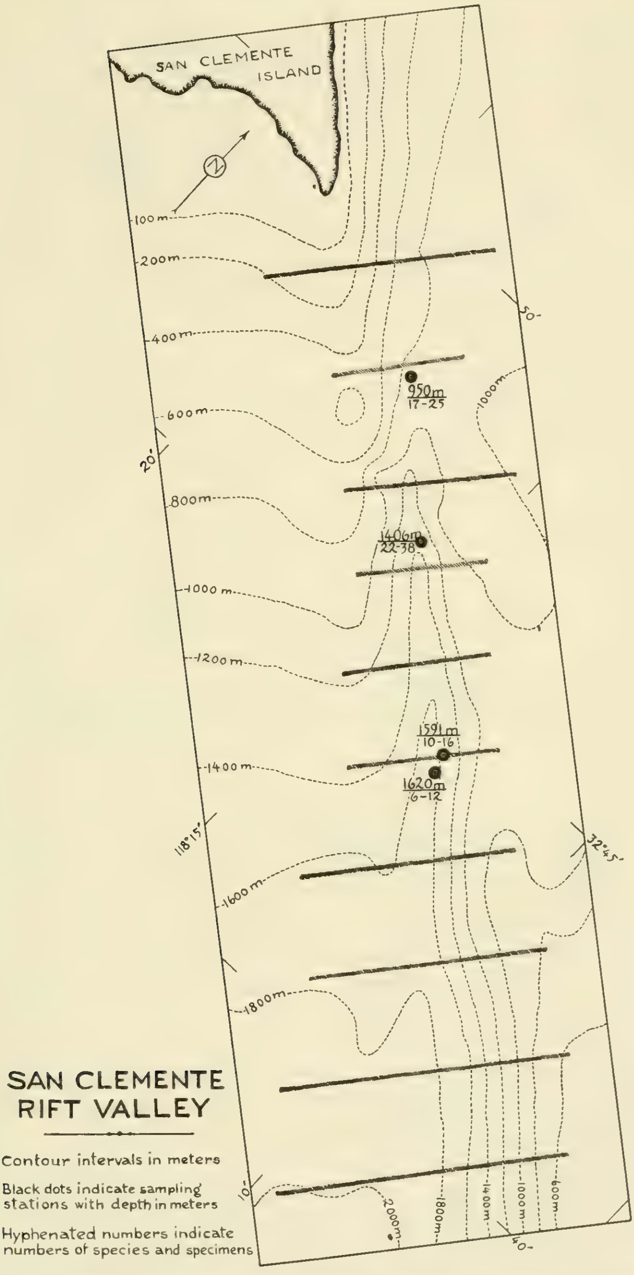



Fig. 15. San Clemente rift valley, with contour intervals in meters. Black dots indicate sampling stations with depth in meters. Hyphenated numbers indicate numbers of species and specimens.

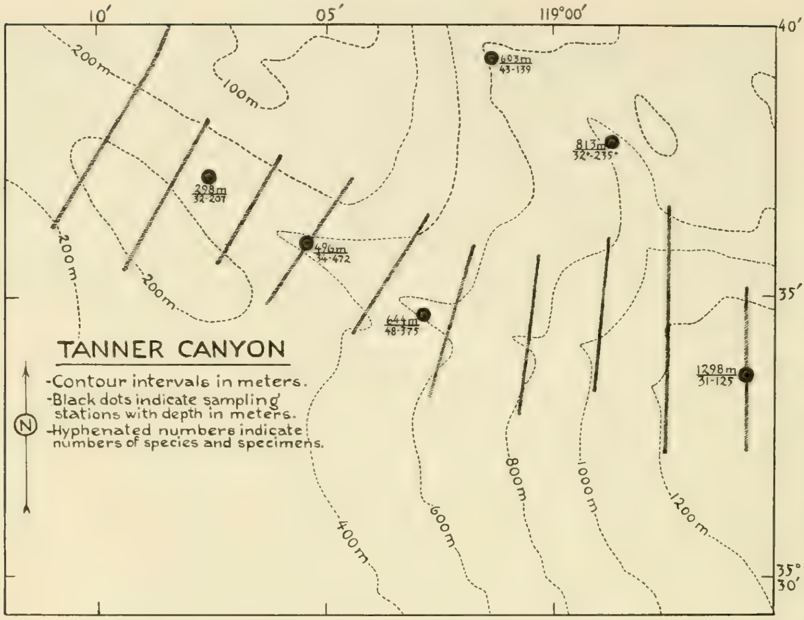



Fig. 16. Tanner canyon, with contour intervals in meters. Black dots indicate sampling stations with depth in meters. Hyphenated numbers indicate numbers of species and specimens.

reddish brown shale scraped from a hard bottom. Only the shallowest sample is from an axis depth; others are 3 to 53 meters above it.

Total numbers of species range from 32 to 48, and specimens from 125 to 375 per sample. The most abundant specifically are polychaetes, then small mollusks, and the most numerous individuals are *Amphipholis pugetana,* numbering 290 in a small sample. The largest individual is *Brissopsis pacifica,* from the shallowest sample, and ophiuroids comprise the bulk in deeper parts of this canyon. Animals from shallower parts resemble those in other offshore canyons. Unique species are two polychaetes, *Paralacydonia paradoxa* and *Pherusa* cf. *collarifera,* also known from the basin; *Dacrydium pacificum;* and a slender sipunculid, perhaps *Golfingia* sp.

## COMPARISON OF SHELF AND CANYON FAUNAS

One of the most conspicuous differences between shelf and canyon faunas is the replacement of animal groups or genera or species from shelf depths to canyons. Red ophiuroids, notably *Amphiodia urtica,*

and some other amphiodids which are well represented along the edge of the shelf with hundreds of individuals in a sample, are sparse or nearly absent in most canyons. The same is true of some of the commonly occurring polychaetes, *Pectinaria californiensis, Prionospio* spp., nephtyids, *Chloeia pinnata,* and a small brown ostracod typically associated with *Amphiodia urtica* in shelf depths. *Listriolobus pelodes,* a tongue-worm, is very abundant on the Santa Barbara shelf and occurs also in shallower depths of Hueneme canyon, but thereafter is replaced by another echiuroid, *Arhynchite.* Sea whips and sea pens which exist over large areas of the shelf and slope lands, are nearly absent from canyon depths.

All canyon walls are characterized by a change in kinds and numbers of animals, changing with depth or sediment to such an extent that the majority of species at one station or depth class will be nearly or entirely replaced by the next depth (see also charts of step-down effects). Where sediments differ grossly the change in specific entities is nearly complete. This sliding scale effect is noted also in numbers of species and specimens, with the shallowest or near shelf depths having the highest numbers, and the deepest and lowest depths having the least. Exceptions are noteworthy, chiefly in those samples containing much detritus or with gravelly sediments, or where normal salinity conditions are believed to be disturbed. At the lowest levels of the longshore canyons the bottoms are impoverished or dead, as in the basins with which they merge.

As the number of kinds and specimens diminishes with depth, so also do biomass values but in a different way. Where there are a few large individuals of brissopsid urchins, or echiuroids, or nemerteans, the total values per sample may be high, with these large individuals comprising most of the weight. When these individuals are lacking or excluded from total weights, the decline is normal, with increasing depth.

## STANDING CROP

Brissopsid echinoderms, thalassemid echiuroids and polychaetes comprise the largest part of the biomass values in canyons, from shallow to moderate depths. Where muds and silts prevail the first two are best developed, in median to low median depths. At shallowest and deepest stations the polychaetes occur in greatest masses, accompanied by mollusks in upper, and by ophiuroid echinoderms in lower levels.

*Hueneme canyon:*—Total weights of living animals, without tubes but with shells of mollusks are given for each sample in the detailed Analyses. These values are here rerated to grams to a square meter; orange-peel grab samples are generally increased by a factor of 4 and Campbell grab samples by 2, unless sample sizes dictate otherwise.

In 98 m weights are negligible but penetration of the grab was unsatisfactory. Other samples yielded the following:

| | |
|---|---|
| 814 grams per sq.m., in 373 meters | 261.4 gm/ sq.m., in 376 m. |
| 723.4 gm/ sq.m., in 183 m. | 60.0 gm/ sq.m., in 165 m. |
| 625.6 gm/ sq.m., in 177 m. | 36.0 gm/ sq.m., in 338 m. |
| 398.0 gm/ sq.m., in 209 m. | 5.6 gm/ sq.m., in 271 m. |
| 309.6 gm/ sq.m., in 373 m. | 5.0 gm/ sq.m., in 456 m. |
| 287.6 gm/ sq.m., in 478 m. | wts. negligible in 621 m. |

Highest biomasses are correlated with kinds of sediments of silt or mud, and lowest values with sand or pebbles. Ranging these values by major groups of animals, the following percentages are obtained:
In 165 m, with 15 grams, chiefly *Glycera* and *Pectinaria* (polychaetes).

In 177 m, with 156.4 grams:

| | |
|---|---|
| polychaetes (*Asychis* and 223 *Heteromastus*) | 51.15% |
| echiuroids (75 *Listriolobus pelodes*) | 45.78 |
| ophiuroids | 1.53 |
| mollusks | 0.77 |
| a nemertean | 0.71 |
| all others, less than | 1.0 |

In 183 meters, with 183.1 grams:

| | |
|---|---|
| polychaetes, chiefly *Glycera robusta* and 245 *Heteromastus filobranchus* | 90.66% |
| 5 nemerteans | 5.79 |
| 3 *Listriolobus pelodes* | 3.11 |
| ophiuroids | 0.33 |
| mollusks | 0.11 |

In 209 meters, with 99.5 grams:

| | |
|---|---|
| polychaetes, chiefly *Travisia pupa, Asychis* and *Nothria pallida* | 50.8% |
| mollusks, chiefly 12 *Yoldia* | 26.5 |
| 1 brissopsid | 19.9 |
| 2 sipunculids | 2.3 |
| ophiuroids | 0.5 |

| | |
|---|---|
| In 271 meters, with 2.8 grams: | |
| 2 *Cyathodonta pedroana* | 92.9% |
| polychaetes | 7.1 |
| In 338 meters, with 9 grams: | |
| polychaetes | 76.7% |
| 1 *Cyathodonta pedroana* | 23.3 |
| In 373 meters, sticky mud, with 406.9 grams: | |
| 9 brissopsids | 53.45% |
| polychaetes | 30.55 |
| mollusks with shells | 9.98 |
| a thalassemid | 4.25 |
| anemone | 1.2 |
| all others, less than | 1.0 |
| In 373 meters, silty mud, with 77.4 grams: | |
| 2 *Arhynchite* | 79.46% |
| polychaetes | 13.56 |
| 9 anemones | 6.20 |
| mollusks | 0.78 |
| In 376 meters, with 65.4 grams: | |
| 2 *Arhynchite* | 47.7% |
| polychaetes, chiefly *Nephtys* and *Spiophanes* | 43.9 |
| a sipunculid | 3.4 |
| 2 nemerteans | 2.4 |
| a ceriantharian | 1.2 |
| mollusks | 0.8 |
| all others, less than | 1.0 |
| In 478 meters, with 143.8 grams: | |
| 6 brissopsids | 86.93% |
| polychaetes | 10.15 |
| 3 *Dentalium* | 1.25 |
| 4 anemones | 1.11 |
| 1 nemertean | 0.56 |

The preponderant weights of brissopsids, polychaetes and echiuroids is fairly constant in this canyon, in depths of 373 to 478 meters.

*Mugu canyon:*— Total weights ranged from a high of 106.8 grams in a sample to zero, in two deep samples, depths of 832 and 929 meters. Rerated to grams per square meter, the results may be expressed as follows:

| | |
|---|---|
| 427.2 gm/ sq.m., in 177 m. | 53.0 gm/ sq.m., in 378 m. |
| 358.4 gm/ sq.m., in 119 m. | 14.6 gm/ sq.m., in 676 m. |
| 124.8 gm/ sq.m., in 367 m. | 1.8 gm/ sq.m., in 755 m. |
| 115.8 gm/ sq.m., in 573 m. | |

Again the correlation of highest values is with sticky or silty mud, and the lowest with sandy or gravelly bottoms. In terms of major groups of animals, the following percentages of weights are shown:

| | |
|---|---|
| In 119 meters, with 89.6 grams: | |
| polychaetes | 44.98% |
| a pagurid crustacean | 44.75 |
| mollusks | 4.7 |
| an *Astropecten* | 4.8 |
| others, less than | 1.0 |
| In 177 meters, with 106.8 grams: | |
| 2 *Brisaster* | 45.88% |
| polychaetes, especially *Travisia pupa* | 30.52 |
| mollusks, esp. *Acila* and *Dentalium* | 13.30 |
| ophiuroids | 7.48 |
| a sipunculid | 1.97 |
| others, less than | 1.0 |
| In 367 meters, with 62.4 grams: | |
| 4 *Arhynchite* echiuroids | 81.73% |
| polychaetes | 11.54 |
| mollusks | 6.41 |
| crustaceans | 0.32 |
| In 378 meters, with 26.5 grams: | |
| 2 brissopsids, *Brisaster* | 72.45% |
| polychaetes | 7.3 |
| In 573 meters, with 57.9 grams: | |
| 4 *Arhynchite* echiuroids | 36.6% |
| a brissopsid, *Brisaster* | 32.8 |
| polychaetes | 18.5 |
| nemerteans | 7.3 |
| a ghost shrimp | 4.8 |
| In 676 meters, with 7.3 grams: | |
| polychaetes, nearly | 100.0% |

| | |
|---|---|
| In 755 meters, with 1.8 grams: | |
| a nemertean | 55.5% |
| polychaetes | 27.8 |
| solenogasters | 16.7 |

In Mugu canyon, therefore, brissopsids and echiuroids were highest in biomasses, followed by polychaetes, mollusks and nemerteans.

*Dume canyon:*—Weights of animals dropped almost directly with depth from a high of 307.4 grams to a square meter, to zero at its lowest depth. These values are as follows:

| | |
|---|---|
| 307.4 gm/ sq.m., in 299 m. | 112.78 gm/ sq.m., in 638 m. |
| 214.56 gm/ sq.m., in 374 m. | 36.7 gm/ sq.m., in 711 m. |
| 202.4 gm/ sq.m., in 398 m. | 32.4 gm/ sq.m., in 652 m. |
| 188.4 gm/ sq. m., in 181.6 m. | 6.0 gm/ sq.m., in 741 m. |
| 181.6 gm/ sq.m., in 530 m. | no life in 905 meters. |

The sediments in these samples were silt or mud, except in 374 m, where they were sand. Biomasses by animal groups gave the following results:

| | |
|---|---|
| In 299 meters, with 153.7 grams: | |
| 3 brissopsid urchins | 74.5% |
| polychaetes | 25.5 |
| In 374 meters, with 536.4 grams: | |
| 2 echinoids | 50.56% |
| polychaetes | 46.28 |
| siliceous sponge | 2.79 |
| all others, less than | 1.0 |
| In 398 meters, with 50.6 grams: | |
| polychaetes | 96.05% |
| mollusks | 3.96 |
| In 507 meters with 47.1 grams: | |
| 4 echinoids | 84.9% |
| polychaetes | 13.7 |
| a ghost shrimp | 1.7 |
| In 530 meters, with 90.8 grams: | |
| 5 brissopsids | 69.38% |
| polychaetes | 16.63 |
| shelled mollusks | 13.99 |

In 652 meters, with 8.1 grams:

| | |
|---|---|
| an echinoid | 76.54% |
| polychaetes | 20.99 |
| nemerteans | 2.47 |

In 711 meters, with 18.4 grams:

| | |
|---|---|
| polychaetes | 76.1% |
| 2 echiuroids | 20.6 |
| a ghost shrimp | 3.3 |

In 741 meters a ghost shrimp weighed 3.0 grams and all other animals were negligible. In 905 meters there were no living animals. The brissopsids belonged chiefly to 2 species: *Brisaster townsendi* and *Brissopsis pacifica,* and the echiuroid to *Arhynchite* sp.

*Santa Monica canyon:*—Total weights of animals were highest in 268 meters but nowhere approached the high values of Hueneme canyon. The values, rerated to grams to a square meter are as follows:

165.2 gm/ sq.m., in 268 m.
110.8 gm/ sq.m., in 454 m.
81.72 gm/ sq.m., in 330 m.
58.8 gm/ sq.m., in 583 m.
43.2 gm/ sq.m., in 475 m.
33.2 gm/ sq.m., in 362 m.
18.4 gm/ sq.m., in 116 m.
17.7 gm/ sq.m., in 810 m.
10.4 gm/ sq.m., in 463 m.
8.8 gm/ sq.m., in 183 m.
8.56 gm/ sq.m., in 431 m.
wts. negligible in 542 m and in 612 m, and zero in 873 m.

Sample sizes were moderately large in all but one, from 116 meters where sediments were sandy silt; this bottom was unique for having unusually large numbers of *Capitella capitata* subspp.; this is not significant as a weighted form but indicates a disturbed or unnatural bottom.

Summaries by major groups of animals show the following percentages:

In 116 meters, with 9.2 grams:

| | |
|---|---|
| *Solemya,* a clam | 42.4% |
| other mollusks | 57.6 |

In 183 meters, with 4.4 grams:

| | |
|---|---|
| *Solemya* and other mollusks | 65.9% |
| polychaetes | 34.1 |

In 268 meters, with 41.3 grams:

| | |
|---|---|
| 3 *Arhynchite* sp. | 72.2% |
| polychaetes | 27.8 |

In 330 meters, with 20.43 grams:

| | |
|---|---|
| 1 *Arhynchite* sp. | 58.88% |
| polychaetes | 41.14 |

In 363 meters with 8.3 grams, polychaetes comprised nearly 100%.

In 431 meters, with 2.14 grams:

| | |
|---|---|
| 1 *Arhynchite* sp. | 57.94% |
| polychaetes | 39.72 |
| brissopsids | 2.35 |

In 454 and 463 meters, with 27.7 and 2.6 grams respectively, polychaetes comprised nearly 100% of the weights.

In 475 meters, with 21.6 grams:

| | |
|---|---|
| 3 brissopsids | 72.2% |
| *Cardita* and *Amphissa* | 27.8 |

In 583 meters, with 29.4 grams:

| | |
|---|---|
| polychaetes | 44.9% |
| 2 brissopsids | 39.5 |
| 1 ghost shrimp | 15.6 |

In 695 meters, with 8.85 grams:

| | |
|---|---|
| brissopsids | 74.0% |
| 1 *Solemya* sp. | 20.0 |
| others | 6.0 |

In 542, 612, 810 and 873 meters, weights were negligible or the bottoms were without living animals.

*Redondo canyon:*—Fifty-four samples were taken from shallowest (57 m) to deepest (853 m) parts, and recognized as coming from south wall, north wall, axis, basin slope and fan depths. Quantitative measurements ran high both weight-wise and by numbers of specimens. Biomass figures are available for some axis and fan depths:

Axis depths:

| | |
|---|---|
| 532.84 gr/ sq.m., in 560 m. | 151.2 gm/ sq.m., in 378 m. |
| 444.5 gr/ sq.m., in 137 m. | 89.4 gr/ sq.m., in 503 m. |
| 340.1 gr/ sq.m., in 246 m. | 42.04 gm/ sq.m., in 611 m. |
| 247.6 gm/ sq.m., in 431 m. | |

Fan depths:

| | |
|---|---|
| 15.6 gm/ sq.m., in 751 m. | 11.32 gm/ sq.m., in 652 m. |
| 14.8 gm/ sq.m., in 808 m. | 11.0 gm/ sq.m., in 853 m. |
| 14.4 gm/ sq.m., in 834 m. | 10.7 gm/ sq.m., in 660 m. |
| 13.6 gm/ sq.m., in 602 m. | 9.0 gm/ sq.m., in 846 m. |

| | |
|---|---|
| 13.6 gm/ sq.m., in 825 m. | 8.8 gm/ sq.m., in 706 m. |
| 12.84 gm/ sq.m., in 686 m. | 4.3 gm/ sq.m., in 810 m. |
| 12.6 gm/ sq.m., in 741 m. | 3.8 gm/ sq.m., in 715 m. |
| 12.6 gm/ sq.m., in 848 m. | |

In 76 meters, 241 specimens of *Amygdalum* (a clam) comprised the bulk of the animal weight. In 378 m the weight was due chiefly to an *Arhynchite,* accompanied by *Listriolobus* in shallower depths. Brissopsid urchins were heaviest in depths of 200 to 611 meters, after which a seastar occurred. Mollusks at 137 meters were mainly *Yoldia* and *Dentalium*. At 378 meters two polychaetes, *Spiophanes* and *Pectinaria,* comprised the bulk.

The deepest parts of Redondo canyon share the biological characteristics of Santa Monica basin; biomasses are very low and animal kinds are similar to the basin.

*San Pedro sea valley:*—Biomass values expressed in grams to a square meter are as follows:

| | |
|---|---|
| 234.8 gm/ sq.m., in 437 m. | 114.0 gm/ sq.m., in 468 m. |
| 206.0 gm/ sq.m., in 522 m. | 28.0 gm/ sq.m., in 740 m. |
| 194.0 gm/ sq.m., in 319 m. | 27.4 gm/ sq.m., in 406 m. |
| 185.2 gm/ sq.m., in 459 m. | 20.0 gm/ sq.m., in 666 m. |
| 141.4 gm/ sq.m., in 187 m. | 8 gm/ sq.m., in 716 m. |
| 156 gm/ sq.m., in 461 m. | 7.8 gm/ sq.m., in 661 m. |

Ranging these samples by major groups of animals, the following kinds comprised the bulk of the weight:

In 187 m, total weight 70.7 grams:

| | |
|---|---|
| polychaetes | 53.75% |
| mollusks, with shells | 33.24 |
| a sipunculid | 11.60 |
| a nemertean | 1.41 |

In 319 meters, total weight 97.0 grams:

| | |
|---|---|
| 5 echinoids, *Brisaster* | 62.9% |
| 2 *Arhynchite* sp. | 33.6 |
| polychaetes | 2.3 |
| nemertean | 1.0 |

In 406 m, with 13.7 grams, polychaetes comprised nearly 100%.

In 437 meters, with 58.7 grams:

| | |
|---|---|
| 3 echinoids | 85.98% |
| polychaetes | 17.04 |
| 1 *Arhynchite* sp. | 6.98 |

In 459 meters, total weight 46.3 grams:

| | |
|---|---|
| 35 *Chloeia* and *Pista* | 97.8% |
| mollusks | 2.2 |

In 461 meters, total weight 39 grams:

| | |
|---|---|
| 3 brissopsids | 77.2% |
| 4 *Arhynchite* sp. | 10.3 |
| polychaetes | 9.7 |
| mollusks | 2.8 |

In 468 meters, total weight 57.0 grams:

| | |
|---|---|
| 3 brissopsids | 66.5% |
| 11 echiuroids | 24.0 |
| polychaetes | 9.5 |

In 522 meters, total weight 51.5 grams:

| | |
|---|---|
| 2 brissopsids | 46.4% |
| polychaetes | 44.7 |
| nemerteans | 8.9 |

In 661 meters, total weight 3.9 grams:

| | |
|---|---|
| polychaetes | 41.03% |
| a ghost shrimp | 25.64 |
| nemerteans | 25.4 |
| a ceriantharian | 5.13 |
| mollusks | 2.56 |

In 666 meters, about 5 grams, of which polychaetes comprised nearly 100%.

In 716 meters, with 5.0 grams:

| | |
|---|---|
| polychaetes | 75% |
| mollusks | 25 |

Below this depths weights were negligible.

*Newport canyon:*—This canyon was sampled in depths of 16 to 741 meters; values were high only in 211 meters and irregularly decreased with depth. Biomass values in grams per square meter are as follows:

| | |
|---|---|
| 506.4 gm/ sq.m., in 211 m. | 102.2 gm/ sq.m., in 97 m. |
| 191.6 gm/ sq.m., in 16 m. | 96.0 gm/ sq.m., in 642 m. |
| 160 gm/ sq.m., in 37 m. | 87.2 gm/ sq.m., in 420 m. |
| 146 gm/ sq.m., in 85 m. | 86.2 gm/ sq.m., in 178 m. |
| 135.6 gm/ sq.m., in 272 m. | 44.8 gm/ sq.m., in 553 m. |

123.2 gm/ sq.m., in 478 m.
115.7 gm/ sq.m., in 235 m.
113.0 gm/ sq.m., in 170 m.
43.0 gm/ sq.m., in 140 m.
less than 10 gm/ sq., in 741 m.

Ranging these values by major groups of animals, the following percentages are obtained:

In 16 meters, with 47.9 grams:

| | |
|---|---|
| 1 *Cerebratulus* sp. | 60% |
| polychaetes | 16.0 |
| crustaceans | 11.0 |
| *Schizocardium* sp. | 9.0 |
| mollusks | 4.0 |

In 37 meters, with 40.8 grams:

| | |
|---|---|
| polychaetes | 38.0% |
| enteropneusts | 37.0 |
| nemerteans | 11.0 |
| others | 12.0 |

In 85 meters, with 73 grams:

| | |
|---|---|
| polychaetes | 86.3% |
| mollusks | 13.7 |

In 97 meters, with 51.1 grams:

| | |
|---|---|
| polychaetes | 81.6% |
| echinoderms | 14.0 |
| mollusks | 2.4 |
| crustaceans | 0.7 |
| others | 1.3 |

In 140 meters, with 21.5 grams:

| | |
|---|---|
| polychaetes | 93.0% |
| mollusks | 7.0 |

In 170 meters, with 56.5 grams:

| | |
|---|---|
| polychaetes | 54.9% |
| nemertean | 41.1 |
| mollusks | 4.0 |

In 178 meters, with 43.1 grams:

| | |
|---|---|
| polychaetes | 70.0% |
| 1 *Brisaster townsendi* | 30.0 |

In 211 meters, with 253.2 grams:

| | |
|---|---|
| 1 *Molpadia intermedia* | 28.0% |
| 1 *Brisaster townsendi* | 13.2 |

| | |
|---|---|
| polychaetes, *Glycera, Pista,* | |
| *Pectinaria* | 47.8 |
| 110 *Acila castrensis* | 11.0 |

In 235 meters, with 57.85 grams:

| | |
|---|---|
| 3 mollusks, *Compsomyax, Yoldia, Dentalium* | 16.3% |
| 154 Pectinaria | 17.35 |
| 71 *Pista disjuncta* | 49.00 |
| 5 *Nothria pallida* | |
| and other polychaetes | 17.35 |

In 272 meters, with 33.9 grams, polychaetes comprised nearly 100% of the biomass.

In 396 meters, with 25.5 grams:

| | |
|---|---|
| polychaetes | 97.5% |
| mollusks | 2.5 |

In 420 meters, with 43.6 grams:

| | |
|---|---|
| echinoderms | 32.5% |
| echiuroids | 30.00 |
| polychaetes | 29.0 |
| mollusks | 6.0 |
| others | 2.5 |

In 478 meters, with 30.8 grams:

| | |
|---|---|
| echinoderms | 74.6% |
| polychaetes | 7.5 |
| mollusks | 6.6 |
| others | 11.3 |

In 553 meters, with 13.7 grams:

| | |
|---|---|
| mollusks | 36.5% |
| echiuroids | 34.3 |
| polychaetes | 29.2 |

In 642 meters, with 24.0 grams:

| | |
|---|---|
| echinoderms | 70.8% |
| mollusks | 20.4 |
| polychaetes | 8.8 |

In summary, therefore, the heaviest animals in Newport canyon change with depth. In shallowest places there are enteropneusts, nemerteans, mollusks and polychaetes. At about 178 meters large brissopsids and *Nephtys* are conspicuous, and at 282 and 396 meters the heaviest are polychaetes. Brissopsids and *Arhynchite* are again present in 420

and 478 meters, and thereafter, a gastropod, *Mitrella permodesta,* accompanied by ampharetid polychaetes or echinoids comprise the bulk of the samples.

*San Diego trench,* northern end: Biomasses are low, ranging from less than a gram to more than 9 grams to a square meter. The bulk of the animal mass consists of ophiuroid echinoderms or polychaetes, in depths ranging from 686 to 846 meters.

*La Jolla canyon:*—Biomass values, in sampled depths of 79 to 976 meters, rerated to grams per square meter, are as follows:

| | |
|---|---|
| 163.6 gm/ sq.m., in 121 meters. | 10.0 gm/ sq.m., in 517 m. |
| 103.8 gm/ sq.m., in 274 m. | 9.6 gm/ sq.m., in 371 m. |
| 35.0 gm/ sq.m., in 79 m. | 5.4 gm/ sq.m., in 793 m. |
| 22.8 gm/ sq.m., in 976 m. | 3.0 gm/ sq.m., in 135 m. |
| 22.4 gm/ sq.m., in 545 m. | negligible, in 708 m. |
| 10.4 gm/ sq.m., in 637 m. | |

The percentages of major animal groups represented in these depths are as follows:

| | |
|---|---|
| In 79 meters, with 17.5 grams: | |
| polychaetes | 55.4% |
| a nemertean | 36.0 |
| mollusks | 8.6 |
| In 121 meters, with 81.8 grams: | |
| shelled mollusks | 49.5% |
| polychaetes | 33.8 |
| ophiuroids | 16.7 |

In 135, 274 and 371 meters, with weights 1.5, 36.9 and 4.8 grams respectively, polychaetes chiefly *Capitella capitata* subspp. comprised nearly the entire biomass.

| | |
|---|---|
| In 517 meters, with 5.0 grams: | |
| polychaetes | 64.0% |
| mollusks, chiefly *Thyasira* | 36.0 |
| In 545 meters, with 11.2 grams: | |
| a brissopsid | 68.8% |
| polychaetes | 22.3 |
| mollusks | 8.9 |
| In 637 meters, with 5.2 grams: | |
| shelled mollusks | 61.5% |
| polychaetes | 38.5 |

In 793 meters, with 2.7 grams:

| | |
|---|---|
| polychaetes | 74.1% |
| mollusks | 25.9 |

In 976 meters, with 11.4 grams:

| | |
|---|---|
| polychaetes | 74.6% |
| pogonophorans | 14.9 |
| ophiuroids | 10.5 |

In 708 meters weights were negligible and the bottom impoverished.

*Coronado canyon:*—This was sampled in depths of 123 to 1265 meters; biomass values are as follows:

| | |
|---|---|
| 211.4 gm/ sq.m., in 960 m. | 30.8 gm/ sq.m., in 123 m. |
| 109.0 gm/ sq.m., in 566 m. | 23.6 gm/ sq.m., in 1265 m. |
| 45.8 gm/ sq.m., in 344 m. | 7.6 gm/ sq.m., in 812 m. |
| 42.2 gm/ sq.m., in 177 m. | 4.8 gm/ sq.m., in 1105 m. |

Most significant in this canyon is the fact that highest values are in considerable depths (960 m), that the shallowest end has low values, associated with the presence of *Capitella,* and that values increase thereafter due to the presence of a diversified shelf fauna. The bottoms are impoverished at about 812 meters, and below this level a deepwater fauna exists. These three dips are best seen at the 177 m, 812 m and 1105 m levels, and the peaks of standing crops at 566 m, 960 m and 1265 m levels.

Percentages of weights by major animal groups are as follows:
In 123 meters, with 15.4 grams:

| | |
|---|---|
| ophiuroids | 68.2% |
| polychaetes | 29.9 |
| crustaceans | 1.9 |

In 177 meters, with 21.1 grams:

| | |
|---|---|
| polychaetes | 68.7% |
| mollusks | 9.5 |
| ophiuroids | 9.0 |
| an echinoid | 3.8 |

In 344 meters, with 22.9 grams:

| | |
|---|---|
| polychaetes | 52.4% |
| 2 echinoids | 42.8 |
| a nemertean | 4.8 |

In 566 meters, with 54.5 grams:

| | |
|---|---|
| 2 echinoids | 93.2% |
| polychaetes | 4.4 |
| sipunculids | 1.8 |

In 812 meters, with 3.8 grams:

| | |
|---|---|
| polychaetes | 97.4% |
| mollusks | 2.6 |

In 960 meters, with 105.7 grams:

| | |
|---|---|
| 6 echinoids | 96.5% |
| polychaetes | 3.5 |

In 1105 meters, with 2.4 grams:

| | |
|---|---|
| polychaetes | 83.3% |
| 2 sipunculids | 12.5 |
| ophiuroids | 4.2 |

In 1265 meters, with 11.8 grams:

| | |
|---|---|
| 2 ophiuroids | 55.1% |
| polychaetes | 44.9 |

*Santa Cruz canyon:*—The samples, coming from depths of 89 to 1624 meters, were low in return; half measured less than 1.5 cuft although taken with the large Campbell grab; they came from sediments of sand, rocks, pebble or mixed sediments. Five others recovered from 2.4 to 5.74 cuft each. Biomasses therefore show a broad range, as follows:

| | |
|---|---|
| 293.6 gm/ sq.m., in 459 m. | 2.0 gm/ sq.m., in 902 m. |
| 35.0 gm/ sq.m., in 218 m. | 1.8 gm/ sq.m., in 676 m. |
| 29.4 gm/ sq.m., in 89 m. | 0.6 gm/ sq.m., in 800 m. |
| 14.0 gm/ sq.m., in 221 m. | 0.2 gm/ sq.m., in 623 m. |

Weights were negligible in 1387 and 1624 meters.

Percentages of weights by major animal groups are as follows:

In 89 meters, with 14.7 grams:

| | |
|---|---|
| polychaetes | 75% |
| mollusks | 21 |
| *Scalpellum* sp., barnacle | 4 |

In 218 meters, with 17.58 grams:

| | |
|---|---|
| ophiuroids | 53.0% |
| polychaetes | 23.0 |
| *Boltenia* (ascidian) | 11.0 |

| | |
|---|---|
| mollusks | 7.0 |
| a sipunculid | 4.0 |

In 221 meters, with 7.08 grams:

| | |
|---|---|
| polychaetes | 47.0% |
| mollusks | 41.0 |
| sipunculid | 7.0 |
| pycnogonid and crustaceans | 4.0 |

In 459 meters, with 146.8 grams:

| | |
|---|---|
| brissopsids | 89.0% |
| polychaetes | 5.4 |
| mollusks | 4.6 |
| 2 isopods | 1.0 |

In 676 meters, with 0.9 grams, chiefly 3 anemones, polychaetes and a nemertean, comprised the biomass.

Weights were negligible in 623, 902, 1387 and 1624 meters, but life was present in all sampled depths and characterized by considerable hexactinellid sponge (not weighed) in 902 meters.

*Catalina canyon:*—Sampled depths of 88 to 1272 meters showed a sharp drop in biomass after 88 meters, increased again to 379 meters, and dropped thereafter to only 4.0 grams per sample, in the deepest part. The values are as follows:

| | |
|---|---|
| 330.6 gm/ sq.m., in 88 m. | 63.6 gm/ sq.m., in 559 m. |
| 267.2 gm/ sq.m., in 379 m. | 38.0 gm/ sq.m., in 914 m. |
| 196.8 gm/ sq.m., in 362 m. | 35.0 gm/ sq.m., in 549 m. |
| 118.4 gm/ sq.m., in 266 m. | 8.5 gm/ sq.m., in 708 m. |
| 88.4 gm/ sq.m., in 216 m. | 8.0 gm/ sq.m., in 1272 m. |

Weights were negligible in 853 meters, partly because the rocky bottom could not be recovered; the same was the case in 708 meters.

Percentages of weights by major groups of animals are as follows:

In 88 meters, with 165.3 grams:

| | |
|---|---|
| ophiuroids | 64.5% |
| holothuroids | 19.0 |
| 4 *Travisia* and other polychaetes | 16.5 |

In 216 meters, with 44.2 grams:

| | |
|---|---|
| polychaetes | 69.0% |
| mollusks | 19.6 |
| ophiuroids | 8.0 |
| sipunculids | 3.4 |

| | |
|---|---|
| In 266 meters, with 59.2 grams: | |
| polychaetes, chiefly *Maldane* | 82.8% |
| a large nemertean | 13.0 |
| 4 sipunculids | 3.4 |
| others, less than | 1.0 |
| In 362 meters, with 98.4 grams: | |
| 5 *Brissopsis pacifica* | 62.3% |
| 12 holothurians | 14.2 |
| polychaetes | 13.0 |
| an echiuroid | 7.5 |
| mollusks | 2.9 |
| ophiuroids | 0.1 |
| In 379 meters, with 133.6 grams: | |
| polychaetes | 47.15% |
| 1 *Allocentrotus* and 1 *Brissopsis* | 39.85 |
| 1 echiuroid | 7.6 |
| 1 holothuroid | 3.8 |
| mollusks | 1.3 |
| others, less than | 1.0 |
| In 549 meters, with 17.5 grams: | |
| 3 brissopsids | 71.4% |
| polychaetes | 18.8 |
| ophiuroids | 9.8 |
| In 559 meters, with 31.3 grams: | |
| 3 echinoids | 60.7% |
| polychaetes | 22.3 |
| mollusks | 9.0 |
| ophiuroids | 8.0 |
| In 957 meters, with 19.0 grams: | |
| polychaetes | 16.5% |
| an echinoid | 5.26 |
| isopods and other crustaceans | 4.8 |
| mollusks with shells | 2.64 |
| others, less than | 1.0 |
| In 1272 meters, with 4.0 grams: | |
| polychaetes | 84.0% |
| ophiuroids | 16.0 |

Weights were negligible in samples coming from rocky bottoms.

Catalina canyon has a shelf fauna in its upper limits. In 559 meters and beyond, the fauna is a deepwater one, characterized by the presence of brissopsids, solenogasters, *Dacrydium,* a small white clam, *Ophiomusium jolliensis,* an ophiuroid, and various polychaetes. Holothuroids occur chiefly above 379 meters, whereas brissopsid urchins are below 362 meters.

*San Clemente rift valley:*—Sampling procedures were unsatisfactory to obtain biomass data; the samples are discussed more completely elsewhere.

*Tanner canyon:*—This was sampled in depths of 298 to 1298 meters. Biomass values ranged as follows:

| | |
|---|---|
| 64.2 gm/ sq.m., in 496 m. | 6.2 gm/ sq.m., in 1298 m. |
| 51.4 gm/ sq.m., in 603 m. | 4.0 gm/ sq.m., in 644 m. |
| 43.4 gm/ sq.m., in 298 m. | 3.8 gm/ sq.m., in 813 m. |

Percentages of weights by major animal groups are as follows:

| | |
|---|---|
| In 298 meters, with 22.3 grams: | |
| 2 echinoids | 61.9% |
| polychaetes | 25.1 |
| ophiuroids | 8.1 |
| mollusks | 2.7 |
| crustaceans | 2.2 |
| In 496 meters, with 32.1 grams: | |
| 1 *Turcicula* (snail) | 36.96% |
| polychaetes | 36.18 |
| ophiuroids | 17.91 |
| an echinoid | 2.72 |
| others | 6.23 |
| In 644 meters, with 2.0 grams: | |
| polychaetes | 55.0% |
| holothurians | 25.0 |
| mollusks | 20.0 |
| In 813 meters, with 2.9 grams: | |
| polychaetes | 51.7% |
| ophiuroids | 48.3 |
| In 1298 meters, with 3.1 grams: | |
| polychaetes | 58.1% |
| sipunculids | 41.9 |

In Tanner canyon large brissopsid echinoids are most conspicuous at 298 and 496 meters. A large snail, *Turcicula,* occurs at 603 meters. Most species are much smaller, greatly diversified, and deepwater, having their more extended distribution in adjacent outer canyons.

The irregularity of biomass data can be further demonstrated by summarizing the totals for all canyons, from north to south and from east to west, each with the numbers of samples, total numbers of cuft taken, and total weights of larger animals in grams, as follows:

| Name of Canyon | Number of Samples | Cubic Feet of All Samples | Total Weight in Grams |
|---|---|---|---|
| Monterey | 5 | 9.2 | 545.3 |
| Hueneme | 14 | 45.54 | 1161.8 |
| Mugu | 9 | more than 24.68 | 352.3 |
| Dume | 10 | 40.66 | 552.4 |
| Santa Monica | 14 | 41.11 | 167.07 |
| Redondo | 54 | more than 92.36 | 939.0 |
| San Pedro | 15 | 56.58 | 460.8 |
| Newport | 13 | 34.7 | 516.1 |
| San Diego | 6 | 14.1 | 13.8 |
| La Jolla | 11 | 27.69 | 178.0 |
| Coronado | 8 | 28.77 | 237.6 |
| Santa Cruz | 10 | 25.6 | 188.3 |
| Catalina | 4 | 25.31 | 549.5 |
| San Clemente | 6 | negligible | negligible |
| Tanner | 4 | 9.93 | 87.5 |

If productivity is estimated in terms of grams per cuft of sediment, the results will show that northern, longshore canyons usually yield more than offshore ones; the exceptions are Catalina canyon, which ranks fourth, and Tanner canyon which is eighth. In the following estimates the samples from Redondo canyon are reduced from 54 to 32, and their total volumes from 92.36 to 27.62 cuft because 22 of the samples come from fan, or subsill depths. These values, from highest to lowest, are as follows:

Monterey canyon, with 59 grams/ cuft. or 2082 gm/ $m^3$
Redondo canyon, with 34 gm/ cuft. or 1200 gm/ $m^3$
Hueneme canyon, with 25.5 gm/ cuft. or 900 gm/ $m^3$
Catalina canyon, with 22 gm/ cuft. or 776.4 gm/ $m^3$
Mugu canyon, with 14.3 gm/ cuft. or 504.6 gm/ $m^3$
Newport canyon, with 14 gm/ cuft. or 494.1 gm/ $m^3$
Dume canyon, with 13.4 gm/ cuft. or 472.9 gm/ $m^3$
Tanner canyon, with 8.7 gm/ cuft. or 306.0 gm/ $m^3$
San Pedro sea valley, with 8.1 gm/ cuft. or 285.8 gm/ $m^3$
Coronado canyon, with 8.0 gm/ cuft. or 282.3 gm/ $m^3$
Santa Cruz canyon, with 7.0 gm/ cuft. or 237.0 gm/ $m^3$
La Jolla canyon, with 6.4 gm/ cuft. or 225.9 gm/ $m^3$
Santa Monica canyon, with 4.0 gm/ cuft. or 141.2 gm/ $m^3$
all others, less than 1 gram per cuft. or 35.3 gm/ $m^3$

The yields in individual samples reached a high of 814 grams to a square meter in Hueneme canyon and varied to 64.2 grams in Tanner canyon; these values are expressed by canyon, with depth, and biomass rerated to grams to a square meter:

Hueneme canyon, with 814 gm/ $m^2$, in 373 meters.
Redondo canyon, with 532.84 gm/ $m^2$, in 560 meters.
Newport canyon, with 506.4 gm/ $m^2$, in 211 meters.
Mugu canyon, with 427.2 gm/ $m^2$, in 177 meters.
Catalina canyon, with 330.6 gm/ $m^2$, in 88 meters.
Dume canyon, with 307.4 gm/ $m^2$, in 299 meters.
Santa Cruz canyon, with 293.6 gm/ $m^2$, in 459 meters.
Coronado canyon, with 211.4 gm/ $m^2$, in 960 meters.
Santa Monica canyon, with 165.2 gm/ $m^2$, in 268 meters.
La Jolla canyon, with 163.6 gm/ $m^2$, in 121 meters.
Tanner canyon, with 64.2 gm/ $m^2$, in 496 meters.

Highest values are generally the result of the presence of one or a few large individuals, these sometimes weighing more than all others combined. Some such animals are thalassemid echiuroids, echinoid echinoderms, large holothurians, or large shelled gastropods.

Lowest values exist in the mouth ends of the canyons along shore, where they join basins. These values range from 2.0 to 20.3 grams to a square meter (Hartman and Barnard, 1958, p. 4) and highest values occur in the outer series of basins, with the highest in Long basin, where a value of 49.7 grams to a square meter was largely due to the presence of an echiuroid worm.

## ABUNDANCE OF ANIMALS RESPECTING AREAL COVERAGE

Total numbers of species and specimens follow a fairly uniform pattern and generally decrease with depth. Infrequent occurrences of very low or very high numbers can be correlated with unusual factors. Thus, the summarized low values in Monterey canyon can be attributed to sparse sampling and the low values in San Clemente rift valley are the result of ineffective penetration by the grab. Other low figures may be noted in Hueneme canyon, in 98 meters, where only 13 species and 30 specimens of polychaetes contrast with much higher numbers in all other depths. This bottom is possibly a disturbed one. The same applies to the one from 271 meters, where only 6 species and 9 specimens are recorded. In Mugu canyon a poor bottom was encountered in 119 meters where only 6 species and 15 specimens were taken; here the presence of *Capitella* suggested a polluted or diluted substratum. In Dume canyon at 299 meters, only 14 species and 20 specimens of polychaetes were tabulated; the sample contained three large specimens of *Brisaster townsendi,* weighing 153.7 grams; it is possible they were predatory on the fauna in their immediate environs.

An unusually high count in Santa Monica canyon, in 116 meters, was due to the presence of *Capitella capitata* subspp., perhaps related to the proximity of outfall lines discharging fresh water. Redondo canyon showed high counts in nearly all samples. Its lowest values occurred on the fan, where impoverished conditions prevail. Unusually high values were encountered in 741 meters, where 309 individuals, nearly all small ampharetid polychaetes, were counted.

In La Jolla canyon, at 274 and 371 meters, the samples were high in specimens of *Capitella.* This canyon was somewhat impoverished

below this depth, but after 708 meters a deep water fauna was present, with large numbers of specimens. Coronado canyon followed a pattern of continued decrease in numbers with depth. Santa Cruz canyon had an upsurge in numbers at 459 meters, where two species of cirratulid polychaetes accounted for much of the increase. Catalina canyon, in 559 meters, had 27 species and 678 specimens, the high numbers resulting from peak numbers of an ampharetid. In Tanner canyon, at 644 meters, 27 species with 135 specimens were mainly due to the presence of various deepwater species.

In most cases cited, an approximate areal coverage by numbers per square meter might be ascertained by increasing the figures by a factor of 2 to 4, depending on the size of the original sample.

The following lists give the numbers of all species and specimens, together with polychaete species and specimens, by name of canyon, depth in meters, and station numbers as logged by the Research Vessel, VELERO IV:

## MONTEREY CANYON

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 38/23 | 399/336 | 168 | 6499 |
| 28/16 | 174/126 | 260 | 6498 |
| 28/13 | 324/239 | 410 | 6497 |
| 14/4 | 309/26 | 750 | 6494 |
| 34/3 | 30/9 | 906 | 6490 |

Number of all species and polychaete species is 71/38; of all specimens and polychaete specimens 1236/736.

## HUENEME CANYON

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 20/13 | 46/30 | 98 | 6905 |
| 24/12 | 260/232 | 165 | 5114 |
| 38/25 | 680/424 | 177 | 5531 |
| 21/13 | 290/272 | 183 | 5688 |
| 25/16 | 224/147 | 209 | 4846 |
| 11/6 | 16/9 | 271 | 6896 |
| 27/19 | 152/118 | 338 | 6897 |
| 24/16 | 323/303 | 373 | 6898 |
| 28/17 | 208/175 | 373 | 5115 |
| 27/18 | 277/254 | 376 | 5532 |
| 37/21 | 280/135 | 397 | 7523 |
| 23+/13 | 138/83 | 456 | 6899 |
| 19/7 | 47/24 | 478 | 6900 |
| 0/0 | 0/0 | 621 | 6901 |

Number of all species and polychaete species is 157/90; of all specimens and polychaete specimens 2941/2208.

## MUGU CANYON

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 130/62 | 1523/421 | 119 | 4852 |
| 10/6 | 19/15 | 124 | 6902 |
| 92/43 | 849/402 | 177 | 4851 |
| 24/12 | 81/52 | 367 | 6903 |
| 30/17 | 151/74 | 378 | 6909 |
| 28/16 | 164/125 | 548 | 6910 |
| 16/10 | 62/53 | 676 | 6911 |
| 18/10 | 49/25 | 755 | 6912 |
| 0/0 | 0/0 | 832 | 6913 |
| 0/0 | 0/0 | 850 | 7521 |

Number of all species and polychaete species is 242/114; of all specimens and polychaete specimens 2898/1167.

## DUME CANYON

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 22/14 | 32/20 | 299 | 6915 |
| 36/15 | 131/80 | 374 | 5505 |
| 20/8 | 55/38 | 398 | 5046 |
| 21/14 | 61/51 | 507 | 5674 |
| 15/10 | 40/22 | 530 | 6916 |
| 21/10 | 235/19 | 580 | 7520 |
| 12/6 | 24/16 | 652 | 5676 |
| 12/6 | 22/11 | 711 | 6917 |
| 6/2 | 8/4 | 741 | 6918 |
| 0/0 | 0/0 | 905 | 2965 |

Number of all species and polychaete species is 91/53; of all specimens and polychaete specimens 608/261.

## SANTA MONICA CANYON

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 28/21 | 9424/9388 | 116 | 6781 |
| 18/10 | 177/114 | 183 | 6780 |
| 49/40 | 139/120 | 268 | 3000 |
| 54/38 | 183/150 | 330 | 3180 |
| 27/16 | 115/102 | 362 | 3179 |
| 16/7 | 92/79 | 431 | 3178 |
| 23/13 | 35/21 | 454 | 2999 |
| 19/11 | 51/35 | 463 | 3399 |
| 19/8 | 131/43 | 475 | 6779 |
| 27/21 | 35/24 | 542 | 3177 |
| 22/14 | 44/24 | 583 | 6778 |
| 17/9 | 29/15 | 612 | 3176 |
| 37/20 | 146/64 | 695 | 7517 |
| 5/4 | 24/23 | 810 | 6777 |
| 1/1 | 1/1 | 873 | 6776 |

Number of all species and polychaete species is 170/118; of all specimens and polychaete specimens 10626/10203.

## REDONDO CANYON, SOUTH WALL

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 64/39 | 1086/532 | 57 | 2359 |
| 40/30 | 364/109 | 76 | 6817 |
| 48/36 | 569/458 | 232 | 2191 |
| 22/19 | 162/155 | 378 | 6816 |
| 12/8 | 33/30 | 519 | 3167 |
| 33/25 | 169/72 | 542 | 2151 |
| 21/14 | 64/47 | 575 | 2150 |

Number of all species and polychaete species is 172/109; of all specimens and polychaete specimens 2447/1408.

## REDONDO CANYON, NORTH WALL

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 88/56 | 834/524 | 107 | 2725 |
| 63/45 | 842/609 | 113 | 2192 |
| 76/47 | 897/357 | 120 | 3385 |
| 69/37 | 501/191 | 122 | 2727 |
| 90/36 | 808/240 | 146 | 5960 |
| 31/24 | 655/644 | 363 | 3166 |
| 27/17 | 122/76 | 465 | 2793 |
| 23/19 | 91/86 | 554 | 3168 |

Number of all species and polychaete species is 237/121; of all specimens and polychaete specimens 4750/2727.

## REDONDO CANYON, AXIS

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 46/40 | 1227/1214 | 137 | 7284 |
| 53/36 | 555/455 | 148 | 3164 |
| 29/21 | 126/114 | 239 | 2149 |
| 38/28 | 141/78 | 246 | 7285 |
| 39/31 | 202/155 | 282 | 6815 |
| 37/29 | 220/184 | 298 | 2148 |
| 43/32 | 411/356 | 344 | 2190 |
| 32/22 | 485/463 | 378 | 7286 |
| 49/26 | 712/122 | 422 | 2189 |
| 27/18 | 244/212 | 431 | 7287 |
| 30/16 | 198/149 | 503 | 7288 |
| 25/13 | 153/96 | 560 | 7289 |
| 27/15 | 165/107 | 611 | 7290 |

Number of all species and polychaete species is 168/106; of all specimens and polychaete specimens 4839/3705.

## REDONDO CANYON, BASIN SLOPE

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 60/40 | 589/387 | 167 | 2789 |
| 47/39 | 452/351 | 310 | 2361 |
| 23/15 | 31/19 | 334 | 2790 |
| 29/19 | 109/86 | 556 | 2792 |

Number of all species and polychaete species is 113/81; of all specimens and polychaete specimens 1181/843.

## REDONDO CANYON, FAN, to 751 meters

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 18/10 | 30/16 | 602 | 2723 |
| 30/22 | 89/52 | 652 | 2362 |
| 23/11 | 93/55 | 660 | 6774 |
| 17/8 | 21/8 | 686 | 2475 |
| 11/6 | 29/24 | 706 | 3169 |
| 19/10 | 45/18 | 715 | 2476 |
| 24/14 | 309/275 | 741 | 2403 |
| 15/10 | 79/72 | 751 | 2474 |

Number of all species and polychaete species is 79/52; of all specimens and polychaete specimens 695/520.

## REDONDO CANYON, FAN, to 800 meters

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 1/0 | 2/0 | 769 | 2791 |
| 0/0 | 0/0 | 774 | 2620 |
| 7/4 | 10/7 | 786 | 6775 |
| 0/0 | 0/0 | 794 | 2363 |
| 0/0 | 1/0 | 796 | 2794 |
| 2/2 | 2/2 | 800 | 2619 |

Number of all species and polychaete species is 10/6; of all specimens and polychaete specimens 15/9.

## REDONDO CANYON, FAN, to 853 meters

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 3/0 | 7/0 | 808 | 2419 |
| 8/6 | 11/0 | 810 | 2404 |
| 5/3 | 11/9 | 825 | 2729 |
| 0/0 | 0/0 | 834 | 2432 |
| 0/0 | 0/0 | 846 | 2405 |
| 0/0 | 0/0 | 848 | 2420 |
| 0/0 | 0/0 | 853 | 2322 |

Number of all species and polychaete species 16/9; of all specimens and polychaete specimens 29/9. Grand total for entire fan depths: 52 species and 741 specimens.

## SAN PEDRO SEA VALLEY

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 47/33 | 218/206 | 187 | 6854 |
| 77/48 | 2660/2558 | 221 | 7174 |
| 32/21 | 106/59 | 319 | 6501 |
| 19/14 | 94/88 | 406 | 7160 |
| 21/11 | 65/46 | 437 | 2219 |
| 24/21 | 105/101 | 459 | 2218 |
| 25/14 | 530/471 | 461 | 5639 |
| 24/14 | 84/51 | 468 | 7155 |
| 24/17 | 76/65 | 522 | 2317 |
| 18/11 | 68/52 | 661 | 6503 |
| 15/7 | 41/21 | 666 | 2336 |
| 17/11 | 22/15 | 716 | 6861 |
| 21/14 | 65/45 | 740 | 7498 |

(Stations 7161 and 7175 in this series, were dredged samples and are not here included.)

Number of all species and polychaete species 212/144; of all specimens and polychaete specimens 4134/3778.

## NEWPORT CANYON

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 62/47 | 1995/1723 | 16 | 7031 |
| 33/26 | 591/509 | 36 | 5006 |
| 36/25 | 902/718 | 36 | 5250 |
| 38/29 | 877/757 | 85 | 7030 |
| 110/50 | 624/367 | 97 | 5367 |
| 16/13 | 106/96 | 140 | 5661 |
| 51/35 | 548/415 | 170 | 7029 |
| 33/23 | 235/116 | 178 | 7054 |
| 46/31 | 454/276 | 211 | 7729 |
| 43/32 | 538/513 | 235 | 7730 |
| 42/31 | 456/435 | 272 | 7028 |
| 34/18 | 135/71 | 420 | 7052 |
| 39/18 | 213/117 | 478 | 7032 |
| 34/23 | 241/182 | 553 | 7051 |
| 32/10 | 156/72 | 642 | 7050 |
| 43/24 | 151/98 | 741 | 7728 |

Number of all species and polychaete species 262/149; of all specimens and polychaete specimens 8222/6468.

## SAN DIEGO TRENCH, NORTH END

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 9/6 | 9/7 | 686 | 7404 |
| 12/7 | 18/13 | 734 | 7403 |
| 26/13 | 60/29 | 768 | 7402 |
| 32/18 | 126/84 | 840 | 7396 |
| 16/8 | 66/56 | 844 | 7399 |
| 14/6 | 17/7 | 846 | 7395 |

Number of all species and polychaete species 58/29; of all specimens and polychaete specimens 296/196.

## LA JOLLA CANYON

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 70/62 | 999/925 | 79 | 7044 |
| 64/54 | 284/242 | 121 | 7038 |
| 35/15 | 938/888 | 135 | 7043 |
| 30/19 | 14,562/14,400 | 274 | 7045 |
| 19/14 | 845/828 | 371 | 7039 |
| 16/11 | 72/17 | 517 | 7046 |
| 22/11 | 55/30 | 454 | 7041 |
| 25/7 | 41/20 | 637 | 7040 |
| 15/8 | 172/162 | 708 | 7048 |
| 38/21 | 229/162 | 793 | 7047 |
| 33/21 | 221/133 | 976 | 7049 |

Number of all species and polychaete species 191/126; of all specimens and polychaete specimens: 18,418/17,807.

## CORONADO CANYON

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 64/38 | 346/112 | 123 | 6846 |
| 70/41 | 508/265 | 177 | 6845 |
| 25/13 | 133/87 | 344 | 6849 |
| 31/16 | 323/215 | 566 | 6852 |
| 29/23 | 109/70 | 812 | 6851 |
| 19/11 | 88/58 | 960 | 6850 |
| 19/11 | 47/19 | 1105 | 6844 |
| 52/17 | 44/17 | 1265 | 6842 |

Number of all species and polychaete species 152/99; of all specimens and polychaete specimens 1598/843.

## SANTA CRUZ CANYON

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 50/44 | 398/374 | 89 | 6803 |
| 29/26 | 92/71 | 218 | 6805 |
| 28/26 | 86/76 | 221 | 6806 |
| 21/17 | 473/367 | 459 | 6804 |
| 17/15 | 41/33 | 623 | 6809 |
| 15/14 | 38/37 | 676 | 6812 |
| 15/14 | 73/71 | 902 | 6808 |
| 11/8 | 18/10 | 1387 | 6810 |
| 1/1 | 1/1 | 1624 | 6811 |

Number of all species and polychaete species 194/120; of all specimens and polychaete specimens 1220/1040.

## CATALINA CANYON

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 45/26 | 998/180 | 88 | 6823 |
| 38/31 | 148/125 | 216 | 6822 |
| 31/20 | 204/170 | 266 | 6821 |
| 41/25 | 278/157 | 352 | 6818 |
| 39/29 | 415/311 | 379 | 6819 |
| 28/14 | 145/61 | 549 | 6831 |
| 37/27 | 763/678 | 559 | 6820 |
| 19/7 | 65/8 | 708 | 6830 |
| 8/5 | 15/7 | 853 | 6829 |
| 41/24 | 304/246 | 914 | 2847 |
| 22/19 | 55/50 | 1272 | 6828 |

Number of all species and polychaete species 163/105; of all specimens and polychaete specimens 3390/1993.

## SAN CLEMENTE RIFT VALLEY

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 17/11 | 25/13 | 950 | 6838 |
| 22/16 | 38/29 | 1406 | 6839 |
| 10/7 | 16/7 | 1591 | 6841 |
| 6/2 | 12/3 | 1620 | 6840 |

Number of all species and polychaete species 43/27; of all specimens and polychaete specimens 91/52.

## TANNER CANYON

| Number of Species Total / Polychaete | Number of Specimens Total / Polychaete | Depth in Meters | Station Number |
|---|---|---|---|
| 32/18 | 207/64 | 298 | 6835 |
| 34/15 | 472/62 | 496 | 6836 |
| 43/22 | 139/71 | 603 | 6834 |
| 48/27 | 375/135 | 644 | 6837 |
| 32/15 | 235/83 | 813 | 6833 |
| 31/19 | 125/41 | 1298 | 6832 |

Number of all species and polychaete species 127/75; of all specimens and polychaete specimens 1553/456.

It can be seen that the highest number of species 'and specimens (cumulative) has not come from Redondo canyon, from which the largest number of samples originate, but from those samples which have come from shallow, or shelf depths, where sediments are mainly silty mud or sand, and where diversity is greatest.

## ON THE REPLACEMENT OF SPECIES IN THE SUBMARINE CANYONS

a. *Replacement of species in successive canyons:*—The replacement of species in successive canyons, from northernmost to southernmost, and from longshore to offshore locations, is best illustrated by naming the species by canyons, in sequence from north to south and from east to west. Because the polychaetes and echinoderms are most completely identified and consistently present, they are used to illustrate the principles involved. Four hundred and one polychaetes and sixty-one echinoderms are named. The occurrence of a species is indicated by an X, and its absence (or unnoted presence) by a blank space.

Listing the specific categories in this order, 37 species of polychaetes are named from Monterey canyon. Twenty-three of these are common to Hueneme canyon, and 69 others are added, including those named, from no. 38, *Aglaophamus* sp., through no. 106, *Travisia pupa* (see below). The sequence continues with Mugu, Dume, Santa Monica,

Redondo, San Pedro, Newport canyons, the San Diego trench, La Jolla and Coronado canyons, all longshore. One notes a conspicuous increase in numbers in Redondo canyon, partly because this was the best sampled of all canyons, and because it extends from shallow, 57 meter, shelf depths where specific categories include shelf species, through slope and basin depths, or a total of about 700 meters vertical depth, and therefore includes faunal components of all depth categories. If other canyons with comparable depth ranges had been sampled as completely, it is possible that comparable high numbers might have been encountered; this possibility merits exploration for future programs.

An abrupt faunal break is noted in going from longshore to offshore canyons, as from Coronado to Santa Cruz and Catalina canyons, with specific numbers 352 to 375 (see below). These species are components of an outer fauna and again show vertical zonation. Another break at San Clemente rift valley reflects a change in physical characters of the bottom, from mud to rock, as well as mechanical difficulties of recovering samples of any size. Tanner canyon, though sampled with few probes, shows a sizeable increase of specific categories, those numbered 390 to 401 (below) not previously encountered. More complete coverage of these outer canyons will doubtless reveal a considerable addition to diversified groups, and many species not previously known.

The listing has further interest in that it reveals the considerable number of species present in all or most canyons.

## Species listed by canyon

**Mt** — Monterey canyon
**H** — Hueneme canyon
**Mu** — Mugu canyon
**Du** — Dume canyon
**Mo** — Santa Monica canyon
**R** — Redondo canyon
**S** — San Pedro sea valley
**N** — Newport canyon
**Di** — San Diego valley
**J** — La Jolla canyon
**Co** — Coronado canyon
**Z** — Santa Cruz canyon
**Ca** — Santa Catalina canyon
**Cl** — San Clemente rift valley
**T** — Tanner canyon

| POLYCHAETES | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Amaeana occidentalis* | x | x | | | | x | | x | | x | x | | | | |
| *Ancistrosyllis tentaculata* | x | x | x | ?x | x | x | x | x | | x | | | x | | |
| *Asychis disparidentata* | x | x | | | x | x | x | x | x | x | | | x | | |
| *Barantolla* sp. | x | | | | | | | | | x | | | | | x |
| *Brada pilosa* | x | | x | x | x | x | x | x | x | x | x | x | | | |
| *Brada pluribranchiata* | x | x | x | | | x | x | x | | | x | | x | | |
| *Capitella capitata* subspp. | x | x | x | | x | x | | x | | x | | | | | |
| *Chaetozone* sp. | x | | | | | | | x | | | | | | | |
| *Chloeia pinnata* | x | x | x | x | x | x | x | x | | x | x | | x | | x |
| *Disoma franciscanum* | x | | | | | x | | | | | | | | | |
| *Eulalia* sp. a or *Hypoeulalia* sp. | x | | | | x | x | x | | | | | | | | |
| *Glycera capitata* | x | x | x | x | x | x | x | x | | x | x | x | x | x | x |
| *Harmothoë* sp. | x | x | x | x | x | x | | x | | x | x | | x | | x |
| *Hesperonoë laevis* or sp. | x | x | x | | x | x | | x | | | | | x | | |
| *Heteromastus filobranchus* | x | x | x | x | x | x | x | x | | x | | | | | |
| *Lepidametria* sp. | x | | | | | | | | | | | | | | |
| *Lepidasthenia longicirrata or* sp. | x | x | | x | x | x | x | x | x | x | | x | | | |
| *Lumbrineris index* | x | | | x | x | x | x | x | | x | | x | x | | |
| *Magelona pacifica* | ?x | | x | | | x | | x | | x | | | | | |
| *Maldane sarsi* or sp. | x | | x | x | x | x | x | x | | x | x | | x | | |

| POLYCHAETES | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Neoheteromastus lineus* | x | | | | | | | | | | | | | | |
| *Nephtys assignis* | x | | | | | | x | x | | | | | | | |
| *Nephtys cornuta* | x | x | x | | | x | | x | | | | | | | |
| *Nereis procera* | x | x | x | x | x | x | x | x | | x | x | x | | | |
| *Nothria iridescens* | x | x | x | x | x | x | x | x | | x | x | | x | | |
| *Nothria pallida* | x | x | | x | | x | x | x | | x | x | | x | | |
| *Owenia* sp. | x | x | | | x | x | | | | | x | x | x | | |
| *Paraonis gracilis* or sp. | x | x | x | | x | x | x | x | x | x | x | x | x | | x |
| *Pectinaria californiensis* | x | x | x | x | x | x | x | x | | x | x | x | x | | |
| *Pholoë glabra* | x | x | x | | x | x | x | x | | x | x | x | x | | |
| *Pilargis maculata* | x | x | | | x | x | x | x | | x | x | | x | | |
| *Prionospio cirrifera* | x | x | | ?x | x | x | | x | | x | | | x | | |
| *Rhodine bitorquata* | x | | x | | x | x | x | x | | x | x | x | | | x |
| *Spiophanes* spp. | x | | x | x | | | | | | | | | | | |
| *Sternaspis fossor* or sp. | x | x | x | x | | x | x | x | | x | x | x | x | x | |
| *Streblosoma crassibranchia* | x | | x | | x | x | | x | | | | x | | | |
| *Tharyx tesselata* | x | x | x | x | x | x | x | x | | x | x | x | x | | x |
| *Aglaophamus* sp. | | x | | x | | x | | x | | x | x | | | x | |
| *Amage anops* or sp. | | x | x | | ?x | x | x | | | x | x | x | x | | |
| *Amphicteis* sp. | | x | | | | x | | | | | x | | | | |
| *Amphiduros,* nr *pacificus* or sp. | | ?x | | | | x | x | | | | | | | | |
| *Anaitides,* nr *groenlandica* | | x | | | | | | | | | | | | | |
| *Anaitides madeirensis* | | x | | | ?x | ?x | | x | | | | x | | | ?x |
| *Aphrodita refulgida* | | x | | | | | | | | | | | | | |
| *Aricidea lopezi* | | x | x | x | x | x | x | x | | x | | x | x | | x |
| *Axiothella rubrocincta* | | x | x | | | | | x | | | | | | | |
| *Axiothella* spp. or *Euclymene* | | x | x | x | x | x | x | x | | x | x | x | x | | |
| *Chone ?infundibuliformis* | | x | x | | | | | | | | | | | | |
| *Cossura pygodactylata* | | x | | | | | | | | | | | | | |
| *Cossura* spp. | | x | x | | | | | | | | | | | | |

| POLYCHAETES | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Dorvillea articulata* | | x | | | x | x | x | x | | | | | x | | x |
| *Dorvillea* spp. | | x | | | | | | | | | | | x | | |
| *Eteone californica* | | x | x | | x | x | ?x | | | | | | | | |
| *Eteone dilatae* | | x | | | | | | | | | | | | | |
| *Eteone* spp. | | x | | | | x | | x | | x | | x | | | |
| *Eunice americana* | | x | x | x | x | x | x | x | | x | x | x | x | | |
| *Glycera americana* | | x | x | x | | x | x | x | | | | x | | | |
| *Glycera robusta* | | x | | | | x | ?x | x | | | x | | | | |
| *Glycera tenuis* | | x | | | ?x | | | x | | | | | | | |
| *Glycera* sp. | | x | | | | | | | | x | | | | | x |
| *Glycinde polygnatha* | | x | | | | | | | | | | | | | |
| *Goniada annulata* | | x | | | x | | | x | | | | | | | |
| *Goniada brunnea* | | x | x | x | x | x | x | x | | x | x | | x | | x |
| *Haploscoloplos elongatus* | | x | x | x | x | x | x | x | x | x | x | x | x | | x |
| *Isocirrus* sp. | | x | | | | | x | | | x | | | | | |
| *Lanice* sp. | | x | | | | | | x | | | | x | x | | x |
| *Laonice cirrata* | | x | ?x | | | ?x | | x | | | | | | | |
| *Laonice foliata* | | x | | | | x | x | x | | x | x | x | x | x | |
| *Lumbrineris bicirrata* | | x | | | x | x | x | | | x | x | x | x | | |
| *Lumbrineris californiensis* | | x | x | | x | x | x | x | | | | | | | |
| *Lumbrineris cruzensis* | | x | x | | x | x | x | x | | x | x | x | x | | |
| *Lumbrineris*, nr *sarsi* | | x | | | | | | | | | | | | | |
| *Lumbrineris simplicis* | | x | | | | | | | | | | | | | |
| *Lumbrineris* spp. | | x | x | | | x | x | x | x | x | x | x | x | | x |
| *Mediomastus californiensis* | | x | x | | | x | | x | | x | x | | | | |
| *Mediomastus glabrus* | | x | | | | | | | | | | | | | |
| *Melinna heterodonta* | | x | | x | x | x | x | x | | | x | | x | | |
| *Myriochele gracilis* | | x | x | x | x | x | x | | x | x | x | x | x | | |
| *Nephtys caecoides* | | x | x | | | | | x | | | | | | | |
| *Nephtys ferruginea* | | x | x | | | x | x | x | | x | x | | x | | |

| POLYCHAETES | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Nephtys glabra* | | x | x | | | | x | | | | | | | | |
| *Nephtys* spp. | | x | x | x | x | x | x | x | | x | | x | x | | |
| *Ninoë gemmea* | | x | x | x | x | x | x | x | x | x | x | x | x | | |
| *Nothria elegans* | | x | | | | | | x | | x | | | | | |
| *Nothria* spp. | | x | x | | | x | | x | | x | x | | | x | |
| *Notomastus lineatus* | | x | | | | | | | | | | ?x | | | x |
| *Onuphis eremita* | | x | | | | | | | | | | | | | |
| *Onuphis vexillaria* | | x | x | x | x | x | x | x | x | | x | | | | x |
| *Ophiodromus pugettensis* | | x | | | x | x | x | | | | | | | | |
| *Oxydromus a. glabrus* | | x | x | x | x | x | x | x | | x | x | | x | | |
| *Oxydromus* sp. | | x | x | | x | x | | | | | | | x | | |
| *Pista disjuncta* | | x | x | x | x | x | x | x | | x | x | | x | | ?x |
| *Pilargis ?hamatus* | | x | | x | x | ?x | ?x | x | | x | x | | x | | |
| *Praxillella a. pacifica* | | x | x | x | x | x | x | x | x | x | x | x | x | | |
| *Prionospio malmgreni* | | x | x | | x | x | x | x | | x | | x | x | | |
| *Prionospio pinnata* | | x | x | x | x | x | x | x | | x | x | x | x | | ?x |
| *Prionospio* spp. | | x | | x | | | | | | | x | x | | | |
| *Scalibregma inflatum* | | x | x | | | x | | x | | x | | x | x | x | |
| *Spiophanes bombyx* | | x | x | | | | | | | | | x | | | |
| *Spiophanes fimbriata* | | x | x | | x | x | x | x | | x | | x | | | x |
| *Spiophanes pallidus* | | x | x | x | | ?x | x | x | x | | x | | x | | |
| *Spiophanes* spp. | | x | x | x | | | x | | | | | | | | x |
| *Terebellides stroemi* or sp. | | x | x | | x | x | x | x | x | x | x | x | x | x | x |
| *Thalenessa spinosa* | | x | x | | | | x | | | | | x | | | x |
| *Travisia gigas* | | x | | | | | | | | | | | | | |
| *Travisia pupa* | | x | x | | | x | x | | | x | x | | x | | |
| *Ammotrypane aulogaster* | | | x | | | x | x | x | | x | x | x | x | | x |
| *Ampharete arctica* | | | x | | x | x | | | | | | | x | | |
| *ampharetids* | | | x | | x | x | | x | x | x | x | x | x | x | x |
| *Amphicteis scaphobranchiata* | | | x | x | x | x | | | | x | x | x | x | | |

| POLYCHAETES | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Ancistrosyllis* sp. | | | x | x | x | x | x | | | x | x | | | | |
| *Anobothrus gracilis* or sp. | | | x | | | x | ?x | | | | x | x | x | | x |
| *Anotomastus gordiodes* | | | x | | | | | x | | | | | | | |
| *Antinoella* sp. | | | x | x | | x | x | x | | | | | | | |
| *Aricidea*, nr. *suecica* | | | x | | x | x | | x | | x | x | | x | | x |
| *Aricidea uschakowi* | | | x | | x | x | x | x | | x | x | x | x | x | |
| *A. (Cirrophorus) aciculata* | | | x | | | x | | x | | | | | | | |
| *Autolytus* spp. | | | x | | x | | | | | | | | | | |
| *Califia calida* | | | x | x | x | x | x | x | | x | x | | x | | |
| *Ceratocephala c. americana* | | | x | | | x | x | x | x | x | x | | | | |
| *Chaetozone corona* | | | x | | | | | x | | | | | | | |
| *Chaetozone spinosa* or sp. | | | x | | | | | | | | x | x | x | | x |
| *Chone gracilis* or sp. | | | x | | x | x | | | | | x | x | x | | |
| *Decamastus gracilis* | | | x | | | | x | | | | | | | | |
| *Diopatra ornata* | | | x | | | | x | x | | | | | | | |
| *Drilonereis* sp. a | | | x | | | x | x | | | x | | x | x | x | x |
| ?*Euchone* sp. | | | x | | | | x | x | | | | | x | | |
| *euclymenid* | | | x | | | | | | | | | | | | |
| *Eulalia*, sp. b | | | x | | | | | | | | | | | | |
| *Eumida sanguinea* | | | x | | | | x | | | | | | | | |
| *Exogone uniformis* or sp. | | | x | | | x | x | | | | x | | | | x |
| ?*Genetyllis* sp. | | | x | | | | | | | | | | | | |
| *Glycera c. branchiopoda* | | | x | | | x | x | x | x | x | x | | x | x | |
| *Glycera convoluta* | | | x | | | | | | | | | x | | | |
| *Goniada acicula* | | | x | | | | | | | | | | | | |
| *Harmothoë priops* | | | x | | | | x | | x | | x | | | | |
| *Lumbrineris longensis* | | | x | | | | | x | | | x | | x | x | |
| *Magelona sacculata* | | | x | | | | x | | | | | | | | |
| *Myriochele* sp. | | | x | | | | | x | | | | | x | x | |
| *Myriowenia californiensis* | | | x | | | | | | | | | | x | | |

| POLYCHAETES | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Notomastus tenuis* | | | x | | | x | x | x | x | | x | | | x | |
| *?Notomastus* sp. | | | x | | | | | | | | | x | x | | |
| *Onuphis parva* | | | x | x | x | x | x | x | x | | x | x | | x | |
| *Owenia f. collaris* | | | x | | | | | | | | | | | | |
| *Pherusa papillata* | | | x | | | x | | | | | | x | | | |
| *Phyllochaetopterus limicolus* | | | x | x | x | x | x | x | x | x | x | x | x | x | x |
| *Phyllodoce* sp. or *phyllodocid* | | | x | | | | x | | x | | x | | x | x | |
| *Pilargis* sp. | | | x | | | x | x | | x | | | | | x | |
| *Platynereis bicanaliculata* | | | x | | x | | | | | | x | | | | |
| *Poecilochaetus johnsoni* | | | x | | x | | x | x | | x | | | | | |
| *Polycirrus ?californicus* or sp. | | | x | | x | x | | x | | | | | | | x |
| *Polydora* spp. | | | x | | | x | | x | | x | x | | | | x |
| *Praxillella* spp. | | | x | | | x | | x | | | x | | x | | |
| *Schistocomus hiltoni* or sp. | | | x | | | | x | | | x | | x | | | |
| *Sphaerosyllis* sp. | | | x | | | | | | | | x | | | | |
| *Spiophanes missionensis* | | | x | | x | x | x | x | | x | x | x | | | |
| *Sthenelais tertiaglabra* | | | x | | x | x | | x | | x | x | | | | |
| *Sthenelais verruculosa* | | | x | | | | x | | | | | | | | |
| *Syllis* or *Typosyllis* sp. | | | x | | | x | x | | | | x | x | | | |
| *Telepsavus costarum* or sp. | | | x | | x | x | | x | | x | | x | | | |
| *Tharyx monilaris* | | | x | | x | x | x | x | x | x | x | x | x | | |
| *Tharyx* spp. | | | x | | x | | | | | | | | x | x | x |
| *Typosyllis* spp. | | | x | | | | | | | | | | | | |
| *Asychis*, unknown sp. | | | | x | | | | | | | x | | | x | |
| *Cirratulus* sp., anoculate | | | | x | x | x | | x | | | | | x | | |
| *Cossura candida* | | | | x | x | x | x | x | x | x | x | x | x | | x |
| *Eumida ?tubiformis* | | | | x | | | | | | | | | | | |
| *Goniada* sp. | | | | x | | | | | | | | x | | | |
| *Harmothoë*, nr *lunulata* or sp. | | | | x | x | x | x | x | | x | x | | x | | |
| *Leiochrides hemipodus* or sp. | | | | x | | x | x | | x | x | x | x | x | x | x |

| POLYCHAETES | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Lumbrineris*, moniliform | | | | x | | | | | | | | | | | |
| *Melinnexis* sp. | | | | x | ?x | x | | x | | | | x | | | |
| nephtyid | | | | x | | | | | | | | | | | |
| *Phylo nudus* or sp. | | | | x | | | | | | | x | | | | |
| sigalionid | | | | x | | x | | | | | | | | | |
| *Apomatus* sp. | | | | x | | | | | | | | | | | |
| *Euphrosine* spp. | | | | x | | | x | | | | | x | | | |
| *Flabelligera infundibularis* | | | | x | | | | | | | | | | | |
| *Hypsicomus californicus* | | | | x | | | | | | | | | | | |
| *Laeospira* sp. | | | | x | | | | | | | | | | | |
| *Lepidonotus caelorus* | | | | x | x | x | | | | | | x | x | | |
| *Lumbriclymene* sp. | | | | x | | | | | | | | | | | |
| *Peisidice aspera* | | | | x | x | | x | | | x | | x | | | |
| *Nicomache* sp. | | | | x | | x | | | | | | x | ?x | | |
| *Pherusa inflata* | | | | x | | | | | | | | | | | |
| *Phyllochaetopterus prolifica* | | | | x | | | | | | | | x | | | |
| *Pista elongata* | | | | x | | | | | | | | | | | |
| *Pseudopotamilla* sp. | | | | x | | | | | | | | | | | |
| *Vermiliopsis ?infundibulum* | | | | x | | | | | | | | | | | |
| *Vermiliopsis ?cornuta* | | | | x | | | | | | | | | | | |
| *Aglaophamus erectans* | | | | | x | x | x | x | | | x | | x | | |
| *Amphicteis mucronata* | | | | | x | | ?x | | | | | | | | x |
| *Amphisamytha* sp. | | | | | x | | | | | | | | | | |
| *Anaitides* spp. | | | | | x | x | x | x | | x | | x | | x | |
| *Aphrodita* spp. | | | | | x | | | | | | | | x | | |
| *Aricidea ramosa* | | | | | x | x | | | x | x | | x | | | x |
| *Aricidea* spp. | | | | | x | | | | x | | | | | | |
| *Armandia bioculata* | | | | | x | x | | | | | | | | | x |
| *Chaetozone gracilis* | | | | | x | | | | | x | | | ?x | | |
| *Cirratulus cirratus* | | | | | x | | | | | | | | | | |

| POLYCHAETES | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Dorvillea gracilis* | | | | | x | | | | | | | | | | |
| *Drilonereis* sp. b | | | | | x | | | | | | | | | | |
| *Eulalia* sp. c | | | | | x | | | | | | | | | | |
| *Eumida* sp., dark barred | | | | | x | x | x | x | | x | | x | | | |
| *Eunice multipectinata* | | | | | x | | | | | | | | | | |
| *Exogonella brunnea* | | | | | x | | | | | | | | | | |
| *Glycinde armigera* or sp. | | | | | x | x | | x | | x | | | | | |
| *Glycinde wireni* | | | | | x | | | | | | | | | | |
| *Lagisca multisetosa* | | | | | x | | | | | | | | | | |
| *Lumbrineris limicola* | | | | | x | x | | | | | x | | | x | x |
| maldanids | | | | | x | | | | | | x | | | | |
| *Marphysa conferta* | | | | | x | | x | | | | | | | | |
| *Marphysa disjuncta* | | | | | x | x | x | | | | | | | | |
| *Nereis p. neonigripes* | | | | | x | x | | | | | | | | | |
| *Paranaitis polynoides* | | | | | x | | | | | x | | | | | |
| *Potamethus mucronatus* or sp. | | | | | ?x | x | x | | | | | | x | | ?x |
| *Praxillella gracilis* | | | | | x | x | x | | | x | | | x | x | x |
| *Protis pacifica* or sp. | | | | | x | x | x | | x | | | | | | |
| *Sphaerodorum papillifer* | | | | | x | | | | | | | | | | |
| *Spio punctata* | | | | | x | | | x | | x | | x | | | |
| *Spiophanes anoculata* | | | | | x | x | | | | | | | x | x | |
| *Typosyllis hyalina* or sp. | | | | | x | | | | | | | | | | |
| *Acrocirrus crassifilis* | | | | | | x | | | | | | | | | |
| *Aglaophamus dicirris* | | | | | | x | | | | | | | | | |
| *Amphiduros* sp. | | | | | | x | | | | | | | | | |
| *Ancistrosyllis* sp. | | | | | | x | | | | | | | | | |
| *Aphrodita japonica* | | | | | | x | | | | | | | | | |
| *Artacamella hancocki* | | | | | | x | | | | | | | | | |
| *Brada glabra* | | | | | | x | x | x | | x | x | | x | x | x |
| *Asclerocheilus* sp. | | | | | | ?x | | | | | | | | | |

| POLYCHAETES | Mt | H | Mu | Du | Mo | R. | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Brada* spp. | | | | | | x | | | | | | | | | |
| *Calamyzas* sp. | | | | | | x | | | | | | | | | |
| capitellid | | | | | | x | | | | | | | | | |
| *Chaetozone ?setosa* | | | | | | x | x | | | | | | | x | |
| *cirratulids* | | | | | | x | | | | | | | | | |
| *?Dasybranchus* sp. | | | | | | x | | | | | | | | | |
| *?Diplocirrus* sp. | | | | | | x | | | | | | | | | |
| *Dorvillea moniloceras* | | | | | | x | | | | | | | | | |
| *Drilonereis ?longa* | | | | | | x | | | | x | x | | | | |
| *Drilonereis ?nuda* | | | | | | x | x | x | | x | x | x | x | | |
| *Euclymene* sp. | | | | | | x | | | | | | | | | |
| *Evarnella fragilis* | | | | | | x | | | | | | | | | |
| flabelligerid | | | | | | x | | | | | | | | | x |
| *Glycera tesselata* | | | | | | x | | | | x | | x | | | x |
| *Glyphanostomum ?pallescens* | | | | | | x | | | | | | | | | |
| *Harmothoë* sp., reticulate | | | | | | x | x | | x | | | | | | |
| *?Hauchiella* sp. | | | | | | x | | | | | | | | | |
| hesionid | | | | | | x | | x | x | | | | | x | |
| *Lagisca* sp. | | | | | | x | x | | | | | | | | |
| *Langerhansia heterochaeta* | | | | | | x | | x | | | | | | | |
| *Laonice* sp. | | | | | | x | x | | | x | | x | | | x |
| *Lepidasthenia interrupta* | | | | | | x | | | | | | | | | |
| *Leanira calcis* | | | | | | x | | | | | | | | | |
| *Lumbrineris bifilaris* | | | | | | x | | | | | | | | | |
| *Lumbrineris ?tetraura* | | | | | | x | | x | | | | | | | |
| *Lysippe annectens* or sp. | | | | | | x | x | x | x | x | | x | x | | x |
| *Maldanella robusta* or sp. | | | | | | x | | | | | | x | | | |
| *Megalomma splendida* | | | | | | x | | | | | | | | | |
| *Nephtys ?californiensis* | | | | | | x | | | | | | | | | |
| *Nereis,* unknown sp. or nereid | | | | | | x | x | x | | | | | x | | |

| POLYCHAETES | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Nerinides maculata* | | | | | | x | | | | | | | | | |
| *Nerinides pigmentata* | | | | | | x | x | | | x | | | | | |
| *Notomastus* sp. | | | | | | x | x | x | | | x | | x | | |
| *Onuphis nebulosa* | | | | | | x | x | | | | | x | | | x |
| *Onuphis* spp. | | | | | | x | | | | | | | | | |
| *Ophelia magna* | | | | | | x | | | | | | | | | |
| ?*Pareurythoë* sp. | | | | | | x | | | | x | | | | | |
| *Panthalis pacifica* | | | | | | x | x | | | x | x | | | | |
| *Paraonis gracilis oculata* | | | | | | x | | | | x | x | | | | |
| *Petaloproctus*, nr *tenuis* or sp. | | | | | | x | | | | | | | | | |
| *Pherusa capulata* | | | | | | x | x | x | | x | x | x | | | |
| *Pherusa neopapillata* | | | | | | x | x | x | | x | x | | | | |
| *Pherusa* spp. | | | | | | x | | | | | | | x | | |
| *Pilargis berkeleyi* | | | | | | x | x | x | | x | | | | | |
| phyllodocids | | | | | | x | | | | | | | | | |
| *Pionosyllis*, unknown sp. | | | | | | x | | | | | | | | | |
| *Pista alata* | | | | | | x | | | | | | | | | |
| *Pista* cf. *cristata* | | | | | | x | | x | | x | | | | | |
| *Pista* spp. | | | | | | x | | | | | x | | | | |
| *Prionospio pygmaeus* | | | | | | x | | | | | | | | | |
| ?*Sige* sp. | | | | | | x | | | | | | | | | |
| *Apistobranchus* sp. | | | | | | x | | | | | | | | | |
| *Sphaerodoridium minutum* | | | | | | x | | | | x | x | | | | |
| *Sthenelanella uniformis* | | | | | | x | x | x | | x | x | x | | | |
| ?*Thelepus* sp. | | | | | | x | | | | | | | | | |
| *Travisia* sp. | | | | | | x | | | | | | | | | |
| *Travisia* cf. *olens* | | | | | | x | | | | | | | | | |
| *Ampharete* spp., small | | | | | | | x | | | | | | | x | x |
| *Amphiduros*, nr *pacificus* | | | | | | | x | | | | | | | | |
| *Anaitides multiseriata* | | | | | | | x | | | | | | | | |

| POLYCHAETES | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Ancistrosyllis groenlandica anoculata* | | | | | | | x | | | | | | | | |
| *Aricidea lopezi rubra* | | | | | | | x | x | | | | x | | | x |
| *Asychis* sp. | | | | | | | x | | | | | | | | |
| *Eumida* sp., long. striped | | | | | | | x | | | | | | | | |
| *Genetyllis castanea* | | | | | | | x | | | | | | | | |
| *Glycinde* sp. | | | | | | | x | | | | | | | | |
| *Lumbrineris latreilli* | | | | | | | x | x | | | | | x | | |
| *Marphysa bellii oculata* | | | | | | | x | | | x | | | | | |
| *Megalomma*, bioculate or sp. | | | | | | | x | | | | | | | | x |
| *Melinnexis moorei* | | | | | | | x | | | | | | | x | |
| *Myxicola infundibulum* | | | | | | | x | | | | | | | | |
| *Nicomache lumbricalis* | | | | | | | ?x | | | | | | | | ?x |
| *Nicomache personata* | | | | | | | ?x | | | | | | | | |
| *Notomastus magnus* | | | | | | | x | | | x | x | x | | | |
| *Odontosyllis phosphorea* | | | | | | | x | | | | | x | | | |
| *Pista ?fasciata* | | | | | | | x | | | | | | | | |
| polynoid | | | | | | | x | | | | | | | | |
| *Prionospio* spp. | | | | | | | x | | | x | | | | | |
| *Sphaerodoridium ?sphaerulifer* | | | | | | | x | | | | | | | | |
| *Arabella ?iricolor* | | | | | | | | x | | | | | | | |
| *Eteone*, long-headed | | | | | | | | x | | x | | | | | |
| *Eupolymnia* sp. | | | | | | | | x | | | | | | | |
| *Goniada littorea* | | | | | | | | x | | | x | | | | |
| *Hyalinoecia juvenalis* | | | | | | | | x | | | | | | | |
| *Loandalia fauveli* | | | | | | | | x | | | | | | | |
| *Lumbriclymene ?lineus* or sp. | | | | | | | | x | x | | x | | | x | x |
| *Lumbrineris acuta* | | | | | | | | x | | | | x | | | |
| *Lumbrineris ?bassi* | | | | | | | | x | | | | | | | |
| *Lumbrineris minima* | | | | | | | | x | | | | | | | |
| *Magelona* sp. | | | | | | | | x | | | | | | | |

| POLYCHAETES | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Notomastus hemipodus* | | | | | | | | x | | | | | | | |
| *Phyllodoce* sp. | | | | | | | | x | | x | | x | | | |
| *Prionospio*, unknown sp. | | | | | | | | x | | | | | | | |
| *Sthenelais* sp. | | | | | | | | x | | | | | | | |
| *Thormora johnstoni* | | | | | | | | x | | | | | | | |
| *Travisia brevis* | | | | | | | | x | | | | | | | |
| *Ceratocephala 1. pacifica* | | | | | | | | | x | | | | | | |
| *Leanira alba* | | | | | | | | | x | | x | | | | |
| *Heterospio catalinensis* | | | | | | | | | x | | | | | | |
| *Maldane cristata* or sp. | | | | | | | | | x | x | | | | | |
| *Melinna* sp., long branchiae | | | | | | | | | x | | | | | | |
| *Caulleriella* sp. | | | | | | | | | | x | | | | | |
| *Ceratonereis paucidentata* | | | | | | | | | | x | | | | | |
| *Pherusa ?collarifera* | | | | | | | | | | x | | x | | | x |
| *Sabellaria* sp. | | | | | | | | | | x | | | | | |
| sabellid | | | | | | | | | | x | | x | x | x | |
| *Scoloplos* sp. | | | | | | | | | | x | | | | | |
| spirorbid | | | | | | | | | | x | | | | | |
| *Asychis*, nr *gotoi* | | | | | | | | | | | x | | | | |
| *Dorvillea atlantica* subsp. | | | | | | | | | | | x | | | | |
| *Euclymene ?reticulata* | | | | | | | | | | | x | | | | |
| *Melinna* sp. | | | | | | | | | | | x | | | | |
| *Notomastus precocis* | | | | | | | | | | | x | | | | |
| *Pholoë* sp., anoculate | | | | | | | | | | | x | | | | |
| *Praxillella trifila* | | | | | | | | | | | x | | | | ?x |
| *Sphaerodorum* sp. | | | | | | | | | | | x | | x | | x |
| polychaete, unknown | | | | | | | | | | | x | x | | | |
| *Ammotrypane pallida* | | | | | | | | | | | | x | | | |
| *Antinoella anoculata* | | | | | | | | | | | | x | | | |
| *Aricidea (Aedicira)*, unknown sp. | | | | | | | | | | | | x | x | | |

| POLYCHAETES | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Aricidea (C.) furcata* | | | | | | | | | | | | x | | | |
| *Chaetozone* sp. | | | | | | | | | | | | x | | | |
| *Clymenopsis cingulata* | | | | | | | | | | | | x | | | x |
| *Dodecaceria* sp. | | | | | | | | | | | | x | | | |
| *Eumida* sp. | | | | | | | | | | | | x | | | |
| ?*Flabelligera* sp., unknown | | | | | | | | | | | | x | | | |
| *Glycera oxycephala* | | | | | | | | | | | | x | | | |
| *Harmothoë ?scriptoria* | | | | | | | | | | | | x | | | |
| *Magelona californica* | | | | | | | | | | | | x | | | |
| *Naineris uncinata* or sp. | | | | | | | | | | | | x | x | | |
| *Nereis anoculis* | | | | | | | | | | | | x | | | |
| *Odontosyllis* sp. | | | | | | | | | | | | x | | | |
| onuphids | | | | | | | | | | | | x | | | x |
| *Plakosyllis americana* | | | | | | | | | | | | x | | | |
| *Polydora*, nr *caulleryi* | | | | | | | | | | | | x | | | |
| *Rhamphobrachium longisetosum* | | | | | | | | | | | | x | | | |
| *Scoloplos ?acmeceps* | | | | | | | | | | | | x | | | |
| terebellid | | | | | | | | | | | | x | | | |
| *Thelepus* sp. | | | | | | | | | | | | x | | | |
| capitellid, A | | | | | | | | | | | | | x | | |
| capitellid, B | | | | | | | | | | | | | x | | |
| *Eunice* sp. | | | | | | | | | | | | | x | | |
| *Heteromastus* sp. | | | | | | | | | | | | | x | | |
| *Leaena caeca* | | | | | | | | | | | | | x | | |
| *Nothria conchylega* | | | | | | | | | | | | | x | ?x | x |
| *Polyophthalmus translucens* | | | | | | | | | | | | | x | | |
| *Praxillura maculata* | | | | | | | | | | | | | x | | |
| *Spiophanes*, unknown sp. | | | | | | | | | | | | | x | | |
| cirratulid, abranchiate | | | | | | | | | | | | | | x | |
| *Glycera*, nr *capitata* | | | | | | | | | | | | | | x | |

| POLYCHAETES | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Harmothoë crassicirrata* | | | | | | | | | | | | | | x | |
| *Scionella japonica* | | | | | | | | | | | | | | x | |
| *Sphaerodorum ?brevicapitis* | | | | | | | | | | | | | | x | |
| *Ampharete* sp., large | | | | | | | | | | | | | | | x |
| *Aricidea*, nr *fauveli* | | | | | | | | | | | | | | | x |
| *Eumida bifoliata* | | | | | | | | | | | | | | | x |
| harmothoid, anoculate | | | | | | | | | | | | | | | x |
| *Myriochele pygidialis* | | | | | | | | | | | | | | | x |
| *Notomastus ?lobatus* | | | | | | | | | | | | | | | x |
| *Notoproctus pacificus* | | | | | | | | | | | | | | | x |
| *Paralacydonia paradoxa* | | | | | | | | | | | | | | | x |
| *Pisione*, nr *remota* | | | | | | | | | | | | | | | ?x |
| *Scoloplos ?armiger* | | | | | | | | | | | | | | | x |
| *Sphaerodoridium*, unknown sp. | | | | | | | | | | | | | | | x |

| ECHINODERMS | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Amphioplus strongyloplax* | x | | x | x | x | x | x | x | | x | x | x | x | | |
| *Amphiura arcystata* | x | | x | | x | x | x | | x | x | x | | x | | |
| *Brisaster townsendi* | x | x | x | x | x | x | x | x | | | | | x | | x |
| ophiuroid | x | | | | | | | | | | | | | | |
| *Amphiodia urtica* | | x | x | x | x | x | x | x | | x | x | x | x | | x |
| *Amphipholis pugetana* | | x | x | x | | x | x | | x | x | | x | x | x | x |
| *Amphipholis squamata* | | x | x | x | x | x | x | x | | x | x | x | x | | x |
| *Amphiura seminuda* | | x | | | | | | | x | | | | x | | |
| *Brissopsis pacifica* | | x | | x | x | x | x | x | x | x | x | x | x | | x |
| *Amphioplus hexacanthus* | | | x | | | x | x | | | | | | | | |
| *Amphiodia digitata* | | | x | | | x | x | | | | | | | | |
| *Amphiodia occidentalis* | | | x | | | | | | | | | | | | |
| *Astropecten californicus* | | | x | | | x | | | | | | | | | |
| *Dendraster excentricus* | | | x | | | | | | | | | | | | |
| *Leptosynapta albicans* or sp. | | | x | | x | x | x | x | | x | x | x | x | | x |
| ?*Ophiacantha abnormis* | | | x | | | | | | | | | | | | |
| *Ophiothrix spiculata* | | | x | | | | | | | | | | | | |
| *Ophiomusium jolliensis* | | | | x | | x | | x | x | | | | x | | x |
| *Pisaster capitatus* | | | | x | | | | | | | | | | | |
| *Ophiacantha diplasia* | | | | x | | | | | | | | | | | |
| *Ophiopholis bakeri* | | | | x | | x | | | | | | x | x | | x |
| *Ophiura lütkeni* | | | | x | | x | | x | | x | x | x | x | | |
| *Mediaster aequalis* | | | | x | | | | | | | | | | | |
| *Rathbunaster californicus* | | | | x | | | | | | | | | | | |
| *Sclerasterias heteropaes* | | | | x | | x | | | | | | | | | |
| *Cucumaria crax* | | | | x | | | | | | | | | | | |
| *Psolus* sp. | | | | x | | | | | | | | | | | |
| *Ophiocynodus corynetes* | | | | | x | | x | | | | | | | | |
| *Amphiacantha amphacantha* | | | | | | x | x | x | | | x | | x | | |
| *Amphichondrius granulosus* | | | | | | x | | | | | | | | | |

| ECHINODERMS | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Molpadia intermedia* | | | | | | x | | | | | x | | x | | |
| *Ophiocnida* sp. | | | | | | x | | | | | | | | | |
| *Pentamera pseudopopulifera* | | | | | | x | x | | | | x | | | | |
| *Ophiopholis longispina* | | | | | | x | | | | | | | x | | |
| *Allocentrotus fragilis* | | | | | | x | x | | | | | | x | | |
| *Asteronyx loveni* | | | | | | x | x | | | | | | | | |
| *Amphiura diastata* | | | | | | x | | | | | | | | x | |
| *Myxoderma platyacanthum* | | | | | | x | | | | | | | | | |
| *Amphichondrius laevis* | | | | | | | x | | | | | | | | |
| *Luidia foliolata* | | | | | | | x | | | | | | | | |
| *Amphiura gymnopora* | | | | | | | | | x | | | | | | |
| *Echinocyamus* sp or ?*terminalis* | | | | | | | | | x | | | | | | x |
| *Ophiura kofoidi* | | | | | | | | | x | x | | | | | |
| *Ophiacantha normani* | | | | | | | | | | x | x | x | x | | x |
| *Ophiura leptoctenia* | | | | | | | | | | | x | | x | x | x |
| *Ophiomusium lymani* | | | | | | | | | | | x | | | | |
| *Pachythone rubra* | | | | | | | | | | | | x | | | |
| *Cucumaria calcigera* | | | | | | | | | | | | x | | | |
| *Spatangus* sp. | | | | | | | | | | | | x | | | |
| *Ophionereis eurybrachyplax* | | | | | | | | | | | | x | | | |
| Ophiolepididae | | | | | | | | | | | | x | | | |
| caudate holothurian | | | | | | | | | | | | | x | | |
| *Ophiacantha pacifica* | | | | | | | | | | | | | x | | |
| *Amphiura diomedeae* | | | | | | | | | | | | | x | | x |
| *Ophiacantha bairdi* | | | | | | | | | | | | | | x | |
| ?*Plexechinus cinctus* | | | | | | | | | | | | | | x | |
| *Astrophiura marionae* | | | | | | | | | | | | | | x | |
| *Amphiodia*, rugose | | | | | | | | | | | | | | | x |
| *Ophiacantha cosmica* | | | | | | | | | | | | | | | x |
| *Ophiacantha phragma* | | | | | | | | | | | | | | | x |
| ?*Ophiacantha* sp. | | | | | | | | | | | | | | | x |

| MOLLUSKS | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Cyathodonta pedroana* | x | x | | | | | x | | | | | | | | |
| *Dentalium rectius* | x | x | x | | | x | x | x | | x | x | | | | |
| *Pandora filosa* | x | | | | | | | | | | | | | | |
| *Saxicavella pacifica* | x | | x | | | x | x | x | | | | | x | | |
| *Aglaja* sp. | | x | | | | x | x | | | x | | | x | | |
| *Amphissa* sp. | | x | | x | | | | | | x | | | | | x |
| *Axinopsida serricatus* | | x | x | x | | x | x | x | | | | | | | |
| *Bittium* sp. | | x | x | | x | x | x | x | | | x | x | | | |
| *Cadulus* spp. | | x | x | x | x | | x | | | x | x | | | | x |
| *Calliostoma* sp. | | x | | | | | | | | | | | | | |
| *Cardita* sp. | | x | | | | | | | | | x | | x | | |
| *Epitonium* sp. | | x | | | | | | x | | | | | | | |
| *Prochaetoderma californicum* | | x | x | x | x | x | x | x | | | x | | x | | x |
| solenogasters | | x | | x | x | x | x | | x | | | x | | | |
| *Yoldia ensifera* | | x | | | | | | | | | | | | | |
| *Acila castrensis* | | | x | | | x | | | | x | | | x | | |
| *Adontorhina cyclia* | | | x | | | x | | | | | | | | | |
| *Amygdalum pallidulum* | | | x | | | x | x | | | x | x | | x | | |
| *Balcis rutila* | | | x | | | x | | | | | | | | | |
| *Cardita ventricosa* | | | x | | x | x | x | x | | | | | | | |
| *Carinoturris* sp. | | | x | | | | | | | | | | | | |
| *Chlamys latiauratus* | | | x | | | | | x | | | | | | | |
| *Colus* sp. | | | x | | | | | | | | | | | | |
| *Crepidula* sp. | | | x | | | | | | | | | x | | | |
| *Cylichnella* sp. | | | x | | | | | | | | x | | x | | x |
| *Lucinisca nuttallii* | | | x | | | | | | | | | | | | |
| *Mitrella* spp. | | | x | | | x | | | | | | | | | |
| *Modiolus neglectus* | | | x | | | | | | | | | | | | |
| *Nassarius perpinguis* | | | x | | | | | x | | | | | | | |
| *Nucula tenuis* | | | x | | | | | | | | | | | | |

| MOLLUSKS | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Odostomia* sp. | | | x | | | | | | | | | | | | |
| *Rochefortia ?aleutica* | | | x | | | | | | | | | | | | |
| *Siliqua* sp. | | | x | | | | | | | | | | | | |
| *Solen* sp. | | | x | | | | | | | | | | | | |
| *Tellina carpenteri* | | | x | | x | x | x | | | | | x | | | x |
| *Compsomyax* sp. | | | | x | | x | x | | | | | | | | |
| *Mitrella permodesta* | | | | x | x | x | x | x | x | x | | | x | | |
| *Solemya* sp. | | | | x | x | x | x | | | x | | | x | | |
| *Acteon* sp. | | | | | x | x | x | | | x | | | | | |
| *Cadulus tolmiei* | | | | | x | x | x | | | | | | | | |
| *Lucinoma annulata* | | | | | x | x | | | | | | | | | |
| *Saxicava arctica* | | | | | x | | | | | | | | | | |
| *Saxicavella* spp. | | | | | x | x | | | | x | | | | | |
| *Semele dehiscens* | | | | | x | | | | | | | | | | |
| *Thyasira* sp. | | | | | x | | | x | | x | x | | | | |
| *Acteocina culcitella intermedia* | | | | | | x | | | | | | | | | |
| *Acteon punctocoelata* | | | | | | x | | x | | | | | | | |
| *Admete californica* | | | | | | x | | | | | | | | | |
| *Amphissa bicolor* | | | | | | x | x | | | | | | | | |
| *Balcis* sp. | | | | | | x | | | | | | x | | | x |
| *Bittium catalinense* | | | | | | x | | | | | | | | | |
| *Bittium rugatum subplanatum* | | | | | | x | | | | | | | | | |
| *Cadulus fusiformis* | | | | | | x | | | | | | | | | |
| *Cardiomya californica* | | | | | | x | | | | | | | | | |
| *Cardiomya pectinata* | | | | | | x | | | | | | | | | |
| *Compsomyax subdiaphana* | | | | | | x | | x | | | | | | | |
| *Crystallophrisson hartmani* | | | | | | x | | | | | | | | | |
| *Crystallophrisson riedli* | | | | | | x | | | | | | | | | |
| *Crystallophrisson rubrum* | | | | | | x | | | | | | | | | |
| *Crystallophrisson scabrum* | | | | | | x | | | | | | | | | |

| MOLLUSKS | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Cuspidaria apodema* | | | | | | x | | | | | | | | | |
| *Cylichnella diegensis* | | | | | | x | | x | | | | | | | |
| *Cymatosyrinx halocydne* | | | | | | x | | | | | | | | | |
| *Dermatomya tenuiconcha* | | | | | | x | | | | | | | | | |
| *Eulima californica* | | | | | | x | x | x | | | | x | | | |
| *Fusinus arnoldi* | | | | | | x | | | | | | | | | |
| *Leda* sp. | | | | | | x | | | | | | x | | | x |
| *Limifossor fratula* | | | | | | x | x | | | | | | | | |
| *Lucina* sp. | | | | | | x | | | | | | | | | |
| *Macoma incongrua* | | | | | | x | | | | | | | | | |
| *Macoma leptonoidea* | | | | | | x | | | | | | | | | |
| *Macoma yoldiformis* | | | | | | x | | x | | | | | | | |
| *Macoma* spp. | | | | | | x | x | | | | | | | | |
| *Malletia pacifica* | | | | | | x | | | | | | | | | |
| *Mangelia* sp. | | | | | | x | | x | | | | | | | |
| *Megasurcula carpenteriana* | | | | | | x | | | | | | | | | |
| *Nassarius* sp. | | | | | | x | | | | | | | | | |
| *Nemocardium centifilosum* | | | | | | x | | x | | | | | | | |
| *Nucula carlottensis* | | | | | | x | | | | | | | | | |
| *Nucula* spp. | | | | | | x | | x | | | | x | x | | |
| *Nuculana conceptionis* | | | | | | x | | | | | | | | | |
| *Nuculana hamata* | | | | | | x | | | | | | | | | |
| *Nuculana spargana* | | | | | | x | | | | | | | | | |
| *Pandora* sp. | | | | | | x | | | | | | | | | |
| *Parvilucina tenuisculpta* | | | | | | x | | | | | | | | | |
| *Parvilucina* sp. | | | | | | x | | | | | | | | | |
| *Pseudopythina* sp. | | | | | | x | | | | | | | | | |
| *Rochefortia tumida* | | | | | | x | | | | | | | | | |
| *Rochefortia* spp. | | | | | | x | x | x | | x | | | x | | |
| *Solamen columbianum* | | | | | | x | | | | | | | | | |

| MOLLUSKS | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Solemya panamensis* | | | | | | x | | | | | | | | | |
| *Sphenia globula* | | | | | | x | | | | | | | | | |
| *Tellina bodegensis* | | | | | | x | | | | | | | | | |
| *Thyasira barbarensis* | | | | | | x | | | | | | | | | |
| *Tindaria californica* | | | | | | x | | | | | | | | | |
| *Turbonilla* spp. | | | | | | x | | x | | | | | | | |
| *Turcicula bairdi* | | | | | | x | | | | | | | | | x |
| *Volvulella tenuissima* | | | | | | x | | | | | | | | | |
| *Volvulella* sp. | | | | | | x | | | | | | | | | |
| *Xylophaga* sp. | | | | | | x | | | | | | | | | |
| *Yoldia scissurata* | | | | | | x | | | | | | | | | |
| *Limatula* sp. | | | | | | | x | | | | | | | | |
| *Yoldia* spp. | | | | | | | x | x | | | | | | | |
| *Crenella decussata* | | | | | | | | x | | | | | | | |
| *Dacrydium pacificum* | | | | | | | | x | x | | x | x | x | x | x |
| *Dentalium neohexagonum* | | | | | | | | x | | | | | | | |
| *Kellia* sp. | | | | | | | | x | | | | | | | |
| ?*Linga* sp. | | | | | | | | x | | | | | | | |
| *Lyonsiella alaskana* | | | | | | | | x | | | x | | | | |
| *Mitrella carinata* | | | | | | | | x | | | x | | | | |
| *Mitrella tuberosa* | | | | | | | | x | | | | | | | |
| *Periploma discus* | | | | | | | | x | | | | | | | |
| caecids | | | | | | | | | | x | | | | | |
| *Cyclopecten* sp. | | | | | | | | | | x | | | | | |
| *Erycina* sp. | | | | | | | | | | x | | | | | |
| *Modiolus* sp. | | | | | | | | | | x | | | | | |
| *Tellina* spp. | | | | | | | | | | x | x | | | | |
| vermetid | | | | | | | | | | x | | | | | |
| *Acila* sp. | | | | | | | | | | | x | | | | |
| *Cuspidaria* sp. | | | | | | | | | | | x | | x | | |

| MOLLUSKS | Mt | H | Mu | Du | Mo | R | S | N | Di | J | Co | Z | Ca | Cl | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Axinopsida* sp. | | | | | | | | | | | | x | | | |
| chitons | | | | | | | | | | | | x | x | | x |
| *Delectopecten* sp. | | | | | | | | | | | | x | | | |
| *Dentalium* sp. | | | | | | | | | | | | | x | | |
| *Crenella* sp. | | | | | | | | | | | | | | | x |
| ?*Margarites* sp. | | | | | | | | | | | | | | | x |

*On the Numerical Values of Polychaete and Echinoderm Species with Latitude and Distance from Shore:*—The following analyses of species in the canyons show the step-down effects resulting from latitude and distance from shore. The kinds of species change from north to south, and from inshore to offshore canyons; some species drop out, others are added. Polychaetes, represented by 37 specific categories in the northernmost, Monterey canyon, are increased by 69 species to total 91 species in Hueneme canyon; 22 are common to Monterey canyon. In Mugu canyon an additional 57 species appear to bring the total to 117 species; of these 22 are common to Monterey canyon and 38 to Hueneme canyon. Proceeding southward, Dume canyon has 70 species; of these 17 are common to Monterey canyon, 20 to Hueneme, 6 to Mugu, and 27 are newly added. The same procedure follows for the remaining areas, named below.

The rise and fall in numbers is irregular, partly because the sampling procedures were not the same; numbers of samples and their sizes varied considerably.

The numbers of echinoderms show a similar pattern of replacement. Four species are named in Monterey canyon. Hueneme is represented by 6, of which 1 is common to Monterey canyon and 5 are added. Mugu canyon has 14 species of which 3 are common to Monterey, and 3 to Hueneme canyon. Dume canyon has 16 species; 2 are known also in Monterey, 4 in Hueneme, none in Mugu and 10 are newly added.

It should be re-emphasized that the number of species does not increase proportionately to the number of samples taken. On the other hand, the number of species increase abruptly when substrata differ. This replacement by canyon, depth, latitude and kinds of sediments can be noted for every benthic species found in the canyons.

| NUMBERS OF POLYCHAETE SPECIES by Canyons | Monterey Canyon | Hueneme Canyon | Mugu Canyon | Dume Canyon | Santa Monica Canyon | Redondo Canyon | San Pedro Canyon | Newport Canyon | San Diego Canyon | La Jolla Canyon | Coronado Canyon | Santa Cruz Canyon | Santa Catalina Canyon | San Clemente Canyon | Tanner Canyon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monterey Canyon | 37[1] | 22 | 22 | 17 | 24 | 31 | 22 | 30 | 4 | 25 | 18 | 13 | 19 | 2 | 7 |
| Hueneme Canyon | +69 | 91 | 38 | 20 | 29 | 42 | 37 | 39 | 8 | 31 | 28 | 26 | 29 | 5 | 16 |
| Mugu Canyon | +57 | | 117 | 6 | 19 | 29 | 27 | 26 | 10 | 18 | 27 | 18 | 22 | 12 | 11 |
| Dume Canyon | +27 | | | 70 | 6 | 8 | 5 | 4 | 2 | 4 | 5 | 9 | 6 | 2 | 2 |
| Santa Monica Canyon | +32 | | | | 110 | 13 | 9 | 5 | 3 | 8 | 3 | 4 | 6 | 4 | 6 |
| Redondo Canyon | +64 | | | | | 187 | 16 | 13 | 3 | 16 | 11 | 8 | 6 | 3 | 6 |
| San Pedro Canyon | +22 | | | | | | 138 | 2 | 0 | 3 | 1 | 3 | 1 | 2 | 4 |
| Newport Canyon | +17 | | | | | | | 136 | 1 | 2 | 2 | 2 | 0 | 1 | 1 |
| San Diego Canyon | + 5 | | | | | | | | 36 | 1 | 1 | 0 | 0 | 0 | 0 |
| La Jolla Canyon | + 7 | | | | | | | | | 115 | 0 | 2 | 1 | 1 | 1 |
| Coronado Canyon | + 9 | | | | | | | | | | 105 | 1 | 1 | 0 | 2 |
| Santa Cruz Canyon | +22 | | | | | | | | | | | 108 | 2 | 0 | 1 |
| Santa Catalina Canyon | + 9 | | | | | | | | | | | | 105 | 1 | 1 |
| San Clemente Canyon | + 5 | | | | | | | | | | | | | 38 | 0 |
| Tanner Canyon | +11 | | | | | | | | | | | | | | 69 |

1 The total numbers of species, by canyon, are minimal, and will in most cases be found somewhat higher if total numbers from separate analyses are added.

| NUMBERS OF ECHINODERM SPECIES by Canyons | Monterey Canyon | Hueneme Canyon | Mugu Canyon | Dume Canyon | Santa Monica Canyon | Redondo Canyon | San Pedro Canyon | Newport Canyon | San Diego Canyon | La Jolla Canyon | Coronado Canyon | Santa Cruz Canyon | Santa Catalina Canyon | San Clemente Canyon | Tanner Canyon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monterey Canyon | 4 | 1 | 3 | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 1 | 3 | 0 | 1 |
| Hueneme Canyon | + 5 | 6 | 3 | 4 | 3 | 4 | 4 | 3 | 3 | 4 | 3 | 4 | 5 | 1 | 4 |
| Mugu Canyon | + 8 | | 14 | 0 | 1 | 4 | 3 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| Dume Canyon | +10 | | | 16 | 0 | 4 | 0 | 2 | 1 | 1 | 0 | 2 | 3 | 0 | 2 |
| Santa Monica Canyon | + 1 | | | | 8 | 0 | 1 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| Redondo Canyon | +10 | | | | | 25 | 4 | 1 | 0 | 0 | 0 | 0 | 4 | 0 | 0 |
| San Pedro Canyon | + 2 | | | | | | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Newport Canyon | + 0 | | | | | | | 9 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| San Diego Canyon | + 3 | | | | | | | | 8 | 1 | 0 | 0 | 1 | 0 | 1 |
| La Jolla Canyon | + 1 | | | | | | | | | 10 | 1 | 1 | 0 | 0 | 0 |
| Coronado Canyon | + 2 | | | | | | | | | | 13 | 0 | 0 | 1 | 0 |
| Santa Cruz Canyon | + 5 | | | | | | | | | | | 14 | 0 | 0 | 0 |
| Santa Catalina Canyon | + 3 | | | | | | | | | | | | 21 | 1 | 1 |
| San Clemente Canyon | + 3 | | | | | | | | | | | | | 6 | 0 |
| Tanner Canyon | + 4 | | | | | | | | | | | | | | 16 |

b. *On the Replacement of Species Within Canyons:*—The replacement of species by depth or canyon is an aspect of zonation best illustrated where there is a considerable specific replacement (see Analyses in the APPENDIX). An example is the distribution pattern of two conspicuous, nearly related brissopsid echinoderms,—*Brissopsis pacifica* and *Brisaster townsendi.* Because they are large, easily identified and may comprise a considerable part of the animal weight in a sample, they are used to illustrate the change of specific occurrences with latitude, depth and proximity to shore. The canyons are named from north to south and from longshore to offshore. Depths are given in meters and range of sampled depths in the right hand column.

It is shown, therefore, that *Brisaster townsendi* is most abundant in northern and longshore canyons and attains its maximum abundance in Hueneme canyon, in 397 meters, whereas *Brissopsis pacifica* is most abundant in Santa Cruz canyon, in 459 meters, as well as in middle and southern longshore canyons. In their median ranges the two may occur in equal numbers.

Among the ophiuroids, *Amphiodia digitata* attains its greatest numbers in shallowest depths along shore and diminishes thereafter; in Redondo canyon their numbers are: 388 specimens at 57 meters; 39 at 107 m, 109 at 122 m and 21 at 146 meters.

*Amphipholis squamata* attains highest numbers in Redondo canyon with 43 specimens in 57 m, 12 in 344 m, 22 in 123 m, and 54 in 177 m. Its highest numbers in offshore canyons are in Catalina, with 105 specimens in 88 m.

*Amphipholis pugetana,* in Redondo canyon, numbers 49 specimens in 542 m; in Santa Cruz canyon there are 10 in 218 m, and 95 in 459 meters. In Tanner canyon its numbers rise to 290 in 496 m, and diminish to 23 in 644 m. This species is more characteristic of outer than of longshore canyons.

*Amphiacantha amphacantha* in Redondo canyon, numbers 11 in 107 m, 24 in 120 m, 25 in 122 m and 5 in 146 meters; its vertical range is thus restricted.

*Amphioplus strongyloplax* in Redondo canyon numbers 14 specimens in 146 m, with fewer numbers at other depths.

*Amphiodia urtica* is one of the most abundant ophiuroids along

## Longshore Canyons

| Name of Canyon With Latitude | Brisaster townsendi With Number of Specimens and Depth in Meters | Brissopsis pacifica | Range of Depths Sampled |
|---|---|---|---|
| Monterey 36° 47' N | 12 spec. in 3 samples in 168 to 410 m | none | 168 to 905 m |
| Hueneme 34° 04' to 07' N | 30 in 4 209 to 478 m | 7 in 2 373 to 478 m | 98 to 621 m |
| Mugu 34° 01' to 04' N | 5 in 3 177 to 676 m | none | 119 to 929 m |
| Dume 33° 54' to 59' N | 11 in 5 299 to 638 m | 11 in 5 398 to 652 m | 299 to 905 m |
| Santa Monica 33° 53' to 55' N | 4 in 2 431 to 475 m | 7 in 4 431 to 583 m | 116 to 873 m |
| Redondo 33° 41' to 49' N | 107 to 611 m | 120 to 560 m | 57 to 853 m |
| south wall | 4 in 2 232 to 519 m | 3 in 3 542 to 575 m | |
| north wall | 5 in 2 107 to 146 m | 3 in 3 120 to 465 m | |
| axis | 34 in 11 239 to 611 m | 7 in 1 in 560 m | |
| basin slope | 6 in 2 167 to 334 m | 3 in 2 334 to 556 m | |
| fan | none | none | |
| San Pedro 33° 38' to 39' N | 30 in 8 221 to 740 m | 16 in 5 240 to 740 m | 100 to 740 m |
| Newport 33° 35' to 36' N | 1 in 1 in 178 m | 7 in 3 420 to 642 m | 16 to 741 m |
| San Diego tr. 33° 13' N | none | 1 in 1 in 840 m | 686 to 846 m |
| La Jolla 33° 49' to 54' N | none | 1 in 1 in 793 m | 79 to 976 m |
| Coronado 32° 30' N | none | 11 in 4 177 to 960 m | 123 to 1265 m |

## Offshore Canyons

| Name of Canyon With Latitude | Brisaster townsendi | Brissopsis pacifica | Range of Depths Sampled |
|---|---|---|---|
| | With Number of Specimens and Depth in Meters | | |
| Santa Cruz 33° 54' to 59' N | none | 8 in 1 in 459 m | 89 to 1624 m |
| Catalina 33° 22' N | 1 in 1 in 549 m | 9 in 4 319 to 708 m | 88 to 1272 m |
| San Clemente 32° 44' to 48' N | none | none | 950 to 1620 m |
| Tanner 32° 33' to 37' N | 1 in 1 in 603 m | 7 in 4 298 to 813 m | 298 to 1298 m |

the outer edge of the shelf (Barnard and Ziesenhenne, 1961, p. 133). In Redondo canyon its maximum numbers are much fewer, to 152 in 146 meters. In Coronado canyon it numbers 85 specimens in 123 m and 107 in 177 m. In Catalina canyon its numbers rise to 606 in 88 m (thus again like a shelf population), and reduce to 27 in 362 m. Other ophiuroid distributions are indicated in the analytical results.

Another aspect of replacement or zonation, is that on the specific level, where closely related species change with depth. This has been illustrated for some of the polychaete families, Onuphidae, Lumbrineridae, Orbiniidae, Glyceridae, and Capitellidae (Hartman, 1959, pp. 313-315). The same principle applies to other families and groups of organisms.

## ON THE TOTAL NUMBERS OF SPECIES IN THE CANYONS

The total numbers of species in most canyons are high, ranging from 262 in Newport canyon to only 43 in San Clemente rift valley. A breakdown of these values, from north to south, and east to west, and by major systematic groups follows (the number of samples taken is given in the last column):

Mt = Monterey, H = Hueneme, Mu = Mugu, D = Dume, Mo = Santa Monica, $R_{sw}$ = Redondo south wall, $R_{nw}$ = north wall, $R_a$ = axis, $R_{sl}$ = slope, $R_f$ = fan, S = San Pedro sea valley, N = Newport, Sd = San Diego trench, J = La Jolla, Co = Coronado, Z = Santa Cruz, Ca = Catalina, Cl = San Clemente rift valley, and T = Tanner canyon:

## Total Numbers of Species

| Canyon | Poly-chaetes | Echino-derms | Mollusks[1] | Crust-aceans[1] | Others | Total | Numbers of Samples |
|---|---|---|---|---|---|---|---|
| Mt | 38 | 4 | 9 | 13 | 7 | 71 | 5 |
| H | 90 | 7 | 23 | 23 | 16 | 159 | 14 |
| Mu | 114 | 14 | 31 | 68 | 15 | 242 | 10 |
| D | 53 | 6 | 12 | 16 | 4 | 91 | 10 |
| Mo | 118 | 11 | 16 | 14 | 11 | 170 | 15 |
| $R_{sw}$ | 109 | 13 | 29 | 16 | 5 | 172 | 7 |
| $R_{nw}$ | 121 | 19 | 46 | 40 | 11 | 237 | 8 |
| $R_a$ | 106 | 10 | 31 | 13 | 8 | 168 | 13 |
| $R_{sl}$ | 81 | 8 | 11 | 6 | 7 | 113 | 4 |
| $R_f$ | 64 | 8 | 11 | 1 | 7 | 91 | 21 |
| S | 144 | 17 | 25 | 11 | 15 | 212 | 15 |
| N | 149 | 14 | 43 | 38 | 18 | 262 | 16 |
| Sd | 29 | 8 | 8 | 5 | 8 | 58 | 6 |
| J | 126 | 12 | 23 | 18 | 11 | 190 | 11 |
| Co | 99 | 13 | 16 | 15 | 9 | 152 | 8 |
| Z | 120 | 19 | 19 | 19 | 17 | 194 | 10 |
| Ca | 105 | 21 | 18 | 11 | 8 | 163 | 11 |
| Cl | 27 | 6 | 2 | 4 | 4 | 43 | 4 |
| T | 75 | 16 | 17 | 13 | 6 | 127 | 6 |

[1] The total numbers for mollusks and crustaceans are generally too low because these groups have been incompletely identified.

On the whole the highest values are in those canyons that were best sampled; for example, Redondo and Newport canyons are high, whereas San Clemente, Tanner, Monterey and San Diego canyons are low. It can be seen that specific diversification is almost as great in offshore, as in longshore canyons.

## CHARACTERISTICS OF ANIMALS IN THE SUBMARINE CANYONS

Benthic animals in shelf depths or heads of canyons near shore are mainly shelf species which have their more extended distribution in depths of less than 100 meters. Many are highly ornamented with spines, lobes, elaborate branchial processes and other epithelial processes. They occur in tremendous numbers and diversity, and range in size from large to small. They vary according to location and to the sediments they occupy. In deeper parts of canyons, where sediments are chiefly mud, most of the animals are burrowing or tubicolous, and soft bodied. They exist in tubes or burrows, or move freely through the sediments. A few have thin shells or fragile calcareous skeletons. Their surface structures tend to be smooth and their shape orbicular or spherical or cylindrical. Some of the typical canyon animals are illustrated in the photographs numbered Figures 17 and 18.

Phylogenetic groups best represented in canyons are polychaetes, echinoid and ophiuroid echinoderms, pelecypod mollusks, solenogaster mollusks, echiuroid worms, holothurian echinoderms, enteropneusts, and some small crustaceans (amphipods, isopods). Some species are found throughout most of the canyons, in a wide range of depths; such are *Chloeia pinnata, Goniada brunnea, Pectinaria californiensis,* paranoids, *Prionospio* species and others. Other species are limited to shallowest, to median or to deepest parts of canyons. Still others are limited to outer or southernmost canyons. The replacement of shelf to slope species varies with canyon and may be partly, but not wholly. dependent on kinds of sediments. The Analyses give more precise data.

It is assumed that many of the mud dwelling species are deposit feeders; others, such as nemerteans and coelenterates, are perhaps predators, and some of the pelecypods may be filter-feeders. The fecal pellets of *Heteromastus filobranchus* (Fig. 19) leave no doubt that this is a deposit feeder. Others of this kind are most of the polychaetes, and perhaps the echiuroids.

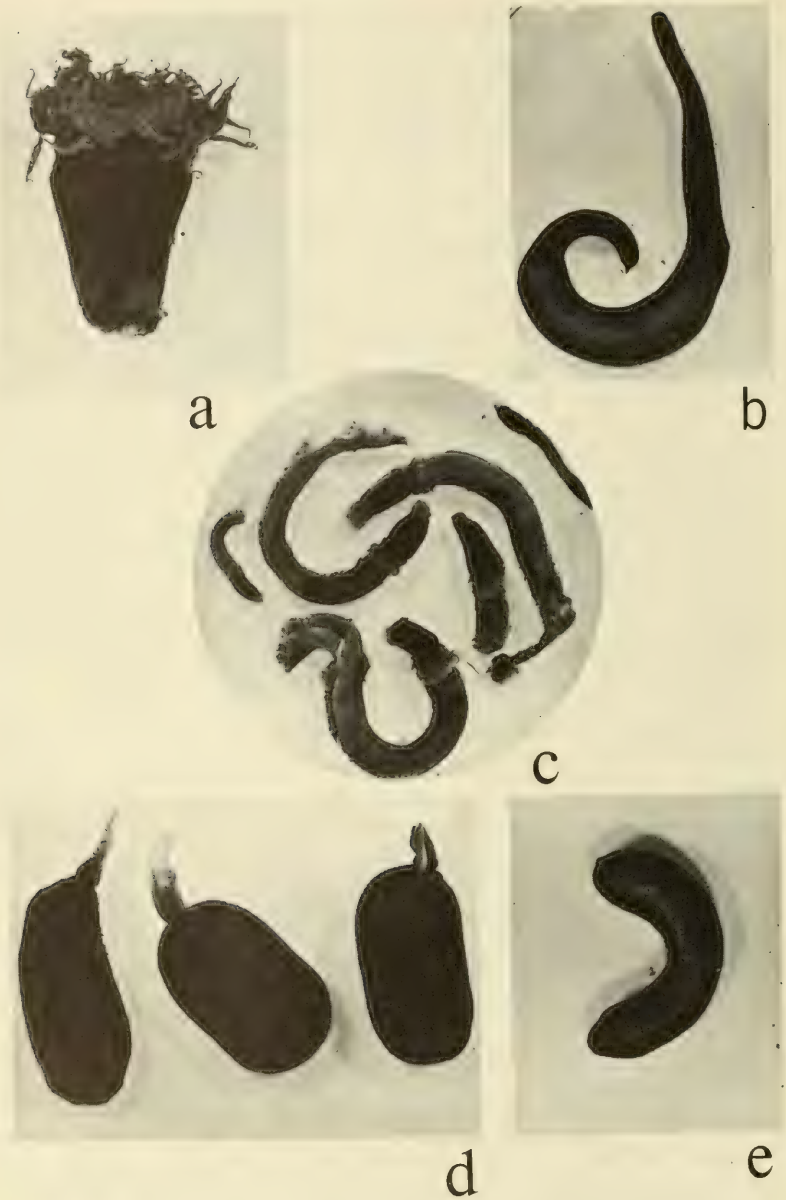



Fig. 17. a, ceriantharian, removed from tube; b, sipunculid, with introvert partly everted; c, enteropneust, showing anterior ends; d, *Listriolobus pelodes,* seen from the sides; e, *Arhynchite* sp., in lateral view, tongue missing.

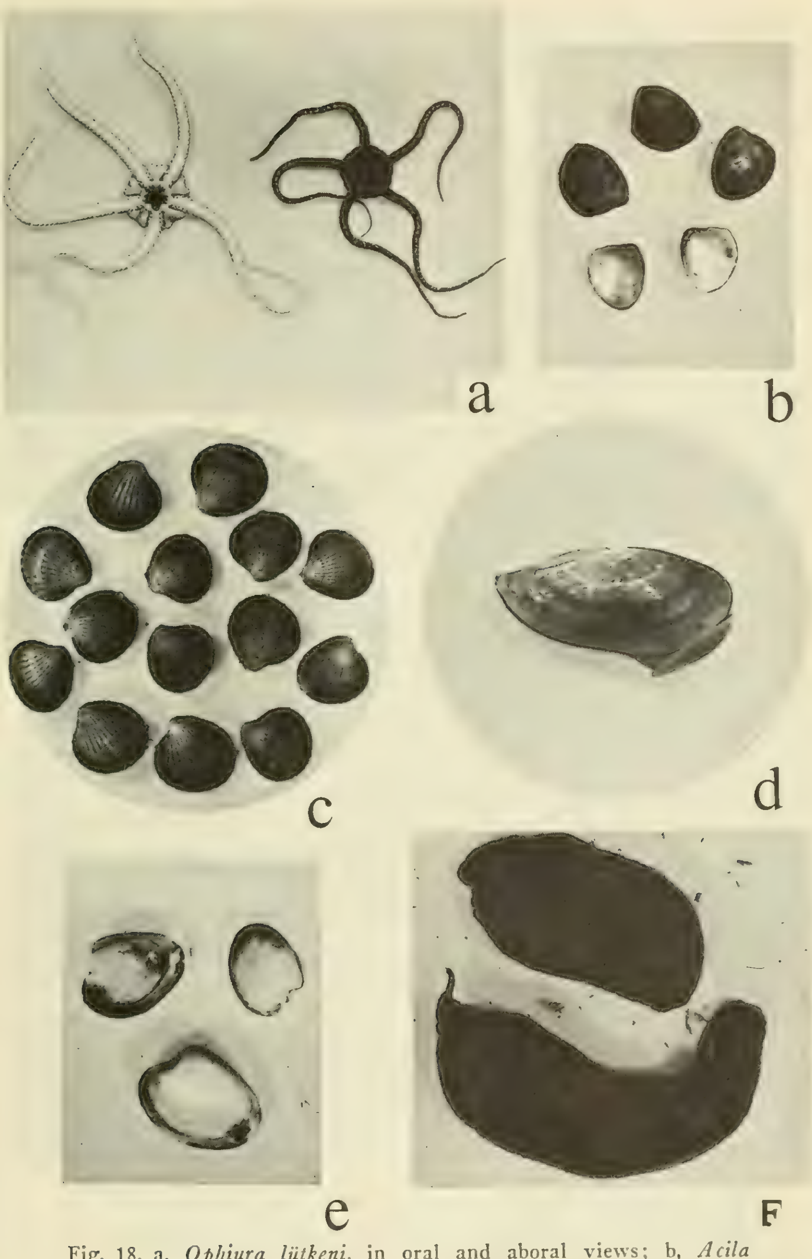



Fig. 18. a, *Ophiura lütkeni,* in oral and aboral views; b, *Acila castrensis,* showing 3 closed and 1 opened shell; c. *Cardita ventricosa;* d, *Solemya panamensis;* e, *Compsomyax subdiaphana;* f, *Molpadia intermedia.*

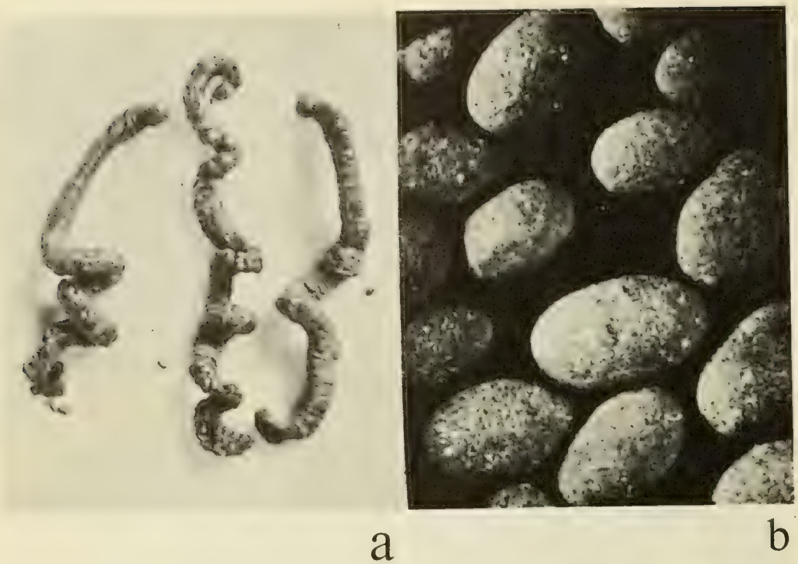



Fig. 19. a, *Heteromastus filobranchus,* a capitellid polychaete, showing two anterior ends and a posterior fragment in the middle, maximum width of animals 3 to 4 mm; b, Fecal pellets of *Heteromastus filobranchus,* from canyon sediments, greatly enlarged. 0.25 mm maximum grain size.

(Photographs prepared by Dr. Jobst Hülsemann and Mr. Kurt Rottweiler).

## PHOTOGRAPHIC RESULTS

Photography of areas covering the sampled bottoms was completed with some success. A camera and light were mounted, one in each of the two jaws of the Campbell grab. This modification of the grab with camera, will be described in a separate report by those who designed it; they include Mr. Logan Smith of Logan Smith Associates, Harbor City, California, and Professor K. O. Emery and Dr. Robert J. Menzies, then in the Allan Hancock Foundation. I am indebted to them for permission to use these photographs and the samples accompanying them. They are numbered 7517 to 7730 in the Station Lists, and analyzed in the Analysis, below.

The area photographed was presumably the same or near that of the sample taken in the grab. There was considerable correlation, as shown by the results. It should be noted that the size of the sample

was usually considerably less than those taken by the same grab without a camera, suggesting that the bite was not as deep.

The following canyons have photographic records.

1. *Mugu canyon,* Sta. 7521, in 850 meters, mud. The photograph (Fig. 20) shows numerous small black specks and fewer white ones, uniformly dispersed over the bottom. The Analyses showed the presence of many dead tube remains of *Phyllochaetopterus limicolus* and white tubes of *Protis pacifica.* There were no living animals. This bottom is characteristic of the subsill parts of San Pedro and Santa Monica basins. The bottom is nearly or altogether dead. The cloud of silt was stirred up by the mechanism of the camera.

Fig. 20. Mugu canyon, Station 7521, in 850 meters. The cloud of silt was stirred up by the camera mechanism. The small irregularities are projecting dead tubes of annelids, and the white fragments possibly *Cyclopecten.* The base line represents about 12 cm.

2. *Dume canyon,* Sta. 7520, in 638 meters, axis, mud. The photograph (Fig. 21) shows a seastar, perhaps *Mediaster* sp., in the upper left hand corner, not taken in the sample. Brissopsids are shown by hooflike depressions, and numbered 12 in the sample recovered. The Analyses show the recovery of 22 species and 236 specimens, of which the largest were 6 brissopsids, 4 *Solemya* measuring up to 38 x 12 mm, and a ghost shrimp. The most numerous were *Compsomyax* sp. with 173 juvenile individuals and *Mitrella permodesta* with 8.

Fig. 21. Dume canyon, Station 7520, in 638 meters. The cloud of silt was stirred up by the triggering mechanism. The upper right hand corner shows a seastar, possibly *Mediaster*. The hooflike depressions are made by brissopsid echinoids. The smaller holes and mounds are those of mollusks, polychaetes and other animals.

3. *Santa Monica canyon,* Sta. 7517, in 695 meters, axis, mud and sand. The photograph (Fig. 22) shows at least 7 hooflike depressions of brissopsids (only one specimen taken) and a large dead *Brisaster,* measuring 40 x 32 mm, spread out at surface, in upper center (also taken), together with 12 short-armed ophiuroids (5 taken, of which only *Ophiomusium* and *Ophiocynodes,* with 3 specimens, are of this kind). The many small holes and mounds may represent the burrows of small clams and polychaete tubes. The Analyses (see below) name 37 species and 206 specimens. Largest individuals are *Solemya,* 40 x 15 mm and *Callianassa* 45 mm long without chela, most abundant are small white clams.

Fig. 22. Santa Monica canyon, Station 7517, in 695 meters. The camera line follows diagonally across the left half of the picture. The large hooflike depressions are those of brissopsids. There are at least twelve ophiuroids and a large dead *Brisaster,* the latter near the upper edge of the photograph. The numerous holes and elevations are of smaller animals.

4. *Newport canyon,* Sta. 7729, in 211 meters, mud. The photograph (Fig. 23) shows a uniformly fine-grained mud bottom, marked with grooves and ridges of embedded animals. The Analyses show the recovery of a very large holothurian, *Molpadia intermedia* (Fig. 24), and many tubes of polychaetes, especially *Pista disjuncta* and *Nothria pallida* (same Fig.). In all 46 species and 454 specimens were taken.

5. *Newport canyon,* Sta. 7730, in 235 meters, mud. The photograph (Fig. 25) shows a fairly smooth, silty bottom with few surface marks. The analysis (see APPENDIX) shows the recovery of 43 species and 538 specimens, of which 32 species and 513 specimens were polychaetes. *Compsomyax subdiaphana* and *Yoldia scissurata,*

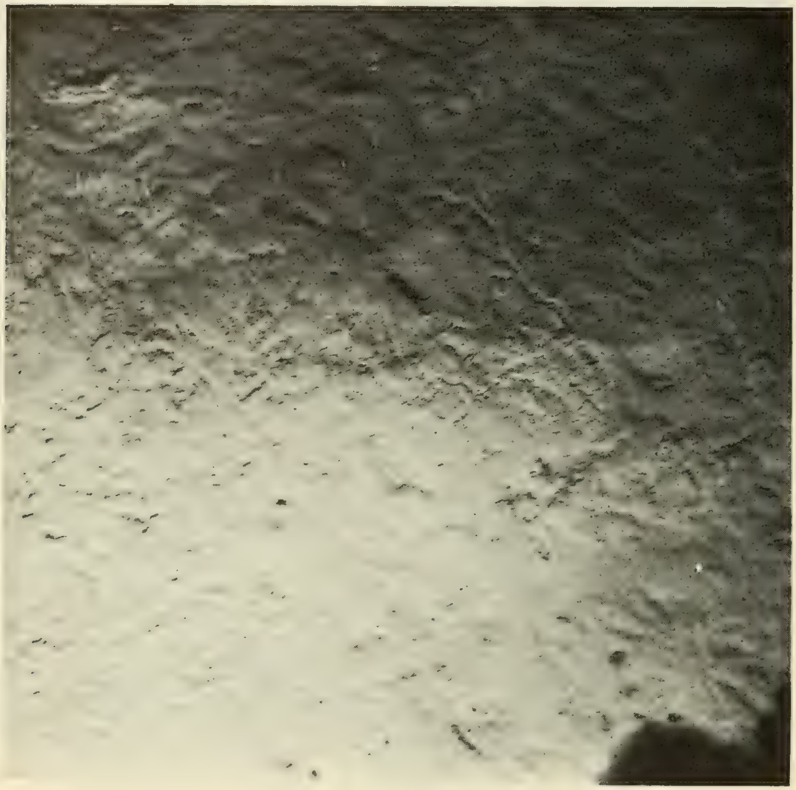


Fig. 23. Newport canyon, Station 7729, in 211 meters. The base line represents about 41 cm. The surface marks are those of embedded organisms.

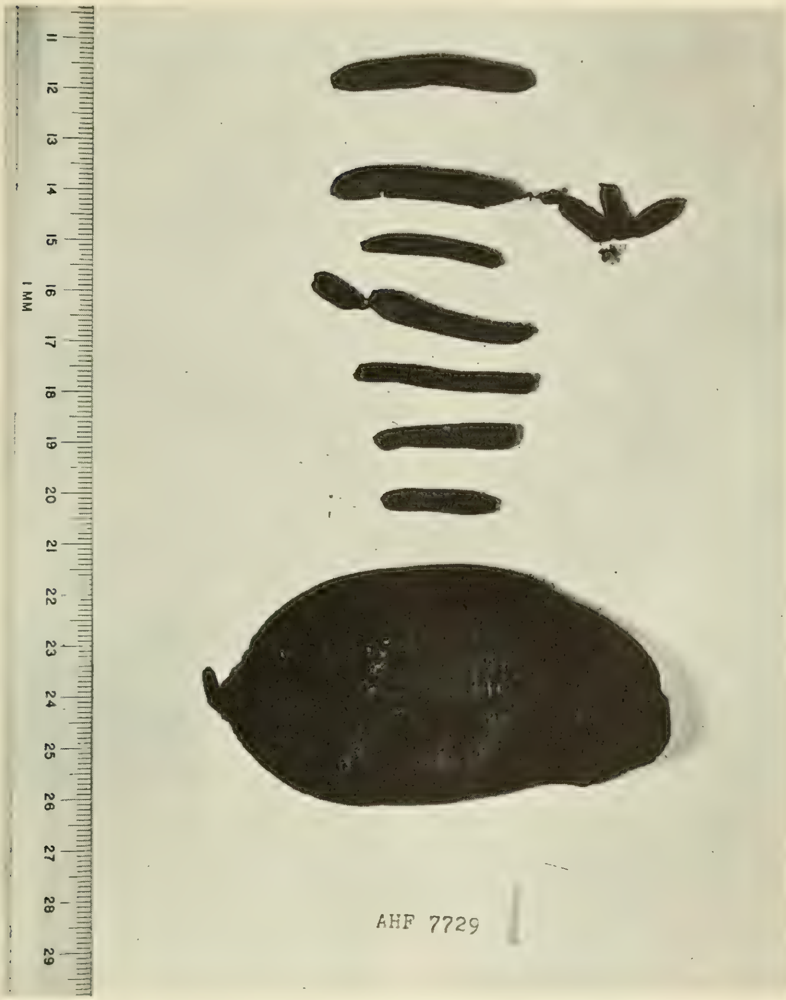



Fig. 24. Largest animals from Newport canyon, Station 7729, in 211 meters, including *Molpadia intermedia,* at the bottom and tube fragments of *Pista disjuncta* and *Nothria pallida,* above.

two clams, were largest, and polychaetes, with 169 *Pectinaria,* 71 *Pista disjuncta,* 59 *Nephtys* spp., were most abundant. Echinoderms and crustaceans were sparse.

6. *Newport canyon,* Sta. 7728, in 741 meters, mud. The photograph (Fig. 26) shows a granular surface; a large ophiuroid *Asteronyx*

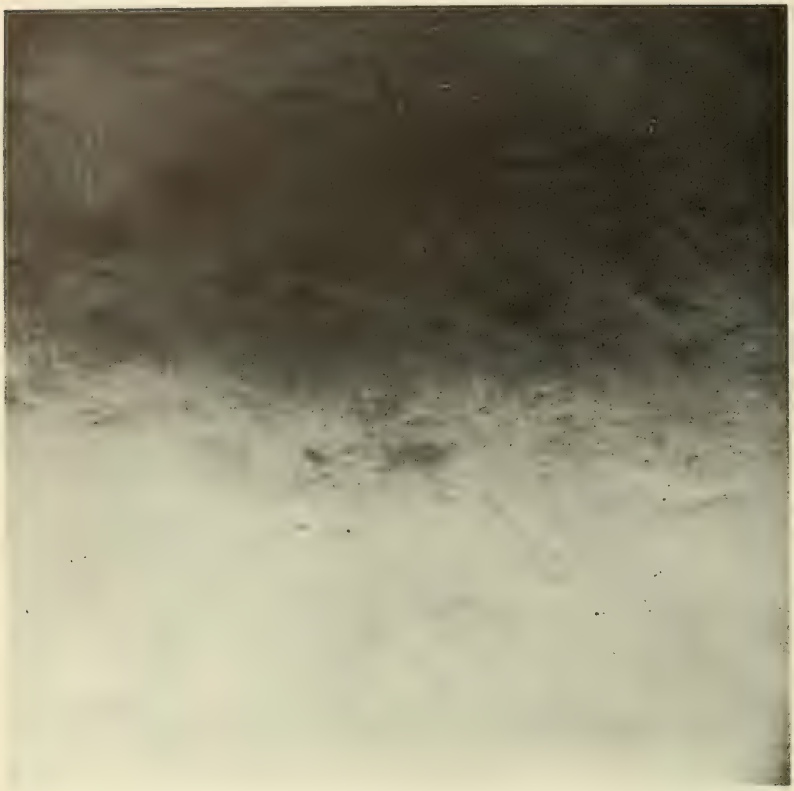


Fig. 25. Newport canyon, Station 7730, in 235 meters. The surface marks are those of tubicolous annelids, especially *Pista disjuncta* and *Nothria pallida.* The two large shallow depressions may have been made by large clams, *Compsomyax or Yoldia.*

*loveni,* and seawhip are shown at the left end; the long tube at the right is a dead tube of *Phyllochaetopterus limicolus;* these three are shown in detail in the next photograph (Fig. 27). The smaller irregularities indicate the sites of other animals; they include 43 species, of which 24 are polychaetes, 8 mollusks, 6 crustaceans, 1 an echinoderm and 4 are other animals. Specimens total 151. The most numerous are polychaetes, *Tharyx* and ampharetids.

Fig. 26. Newport canyon, Station 7728, in 741 meters. The surface features include a large ophiuroid, *Asteronyx loveni* and a small seawhip, at the left side of the photograph, and a long, slender, dead tube of *Phyllochaetopterus limicolus,* at the right. The smaller surface features are those of much smaller, embedded animals.

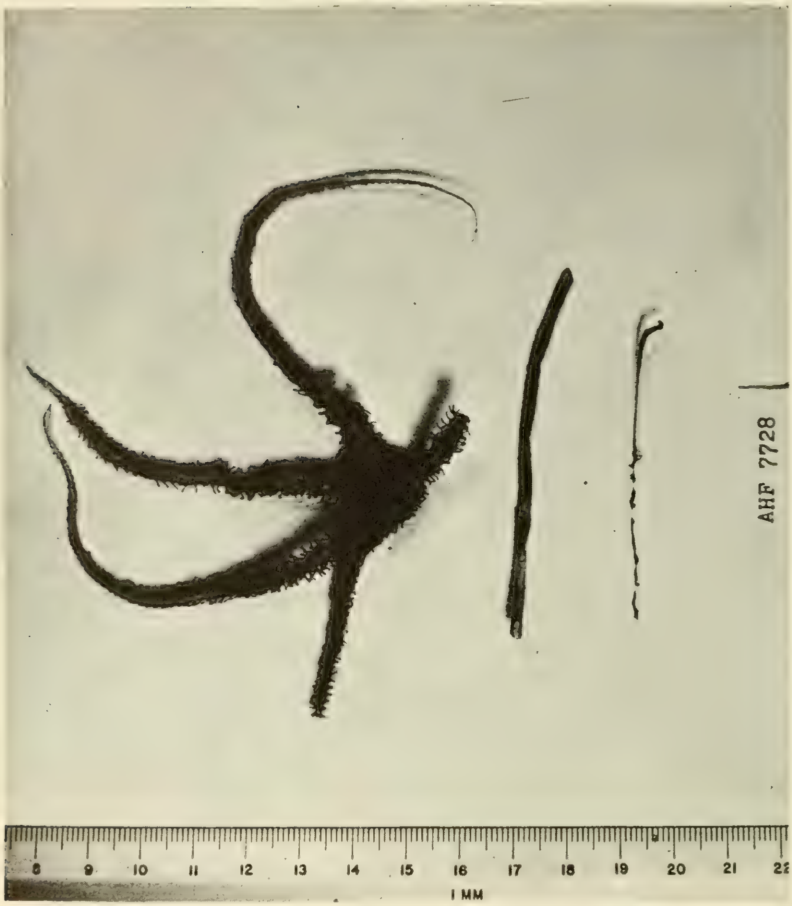



Fig. 27. The three largest animals from Newport canyon, Station 7728, *Asteronyx loveni, Phyllochaetopterus limicolus* tube, and seawhip, with embedded end at the top.

## LIST OF STATIONS

R 2139. Aug. 6, 1952. 8.2 mi WSW of Point Vincente.
33°-41′-28″; 118°-33′-38″. In 801 meters. OPG took 1.89 cuft mud.

R 2148. Sept. 26, 1952. 2.2 mi WSW of Redondo Beach pier.
33°-49′-32″; 118°-25′-53″. In 298 meters. OPG took 2.8 cuft mud.

R 2149. Sept. 26, 1952. 1.7 mi WSW of Redondo Beach pier.
33°-49′-54″; 118°-25′-27″. In 239 meters. OPG took 2.17 cuft mud.

R 2150. Sept. 26, 1952. 7 mi WSW of Redondo Beach pier.
33°-47′-56″; 118°-31′-16″. In 575 meters. OPG took 1.38 cuft mud.

R 2151. Sept. 27, 1952. 6.4 mi WSW of Redondo Beach pier.
33°-48′-06″; 118°-30′-39″. In 542 meters. OPG took 0.5 cuft mud.

R 2189. Dec. 5, 1952. 4.5 mi WSW of end of Redondo Beach pier.
33°-48′-33″; 118°-28′-30″. In 422 meters. OPG took 1.97 cuft fine sandy mud.

R 2190. Dec. 5, 1952. 2.8 mi WSW of end of Redondo Beach pier.
33°-49′-19″; 118°-26′-38″. In 344 meters. OPG took 3.02 cuft fine sandy mud.

R 2191. Dec. 5, 1952. 1.65 mi WSW of end of Redondo Beach pier.
33°-49′-42″; 118°-25′-18″. In 232 meters. OPG took 2.7 cuft fine sandy mud.

R 2192. Dec. 5, 1952. 1.1 mi WSW of end of Redondo Beach pier.
33°-49′-58″; 118°-24′-40″. In 113 meters. OPG took 1.51 cuft fine sandy mud.

S 2218. Feb. 27, 1953. 3 mi SW of Point Fermin light.
33°-40′-01″; 118°-19′-59″. In 459 meters. OPG took 2.83 cuft dark green mud.

S 2219. Feb. 27, 1953. 2.6 mi WSW of Point Fermin light.
33°-41′-02″; 118°-20′-21″. In 437 meters. OPG took 2.96 cuft dark green mud.

S 2317. May 19, 1953. 4.3 mi S of Point Fermin light.
33°-38′-00″; 118°-17′-57″. In 522 meters. OPG took 2.83 cuft mud.

R 2322. June 24, 1953. 4.6 mi SSW of Point Vincente light.
33°-40′-02″; 118°-26′-03″. In 853 meters. OPG took 2.77 cuft fine mud.

S 2336. June 25, 1953. 4.6 mi SSW of Point Fermin light.
33°-38′-09″; 118°-19′-52″. In 666 meters. OPG took 2.83 cuft green mud.

R 2358. July 8, 1953. 3.4 mi WNW of Point Vincente light.
33°-46′-12″; 118°-28′-04″. In 125 fathoms. OPG took 2.89 cuft light clay.

R 2359. July 8, 1953. 3.2 mi SW of Redondo Beach, end of pier.
33°-48′-00″; 118°-26′-03″. In 57 meters. OPG took 0.63 cuft sandy clay.

R 2361. July 8, 1953. 6.4 mi WSW of Redondo Beach, end of pier.
33°-47′-03″; 118°-30′-07″. In 310 meters. OPG took 1.44 cuft sandy mud.

R 2362. July 8, 1953. 6.3 mi WNW of Point Vincente light.
33°-46′-02″; 118°-31′-52″. In 652 meters. OPG took 2.83 cuft fine mud.

R 2363. July 8, 1953. 5.3 mi WSW of Point Vincente light.
33°-41′-55″; 118°-30′-06″. In 652 meters. OPG took 2.77 cuft fine mud.

R 2403. Sept. 16, 1953. 2.8 mi W of Point Vincente light.
33°-44′-08″; 118°-28′-00″. In 741 meters. OPG took 3.15 cuft green mud.

R 2404. Sept. 16, 1953. 3.75 mi SW of Point Vincente light.
33°-41′-58″; 118°-28′-00″. In 810 meters. OPG took 1.07 cuft gray sandy mud.

R 2405. Sept. 16, 1953. 5.35 mi SSW of Point Vincente light.
33°-40′-00″; 118°-28′-00″. In 846 meters. OPG took 2.26 cuft sandy mud.

R 2419. Sept. 29, 1953. 2.8 mi SSW of Point Vincente light.
33°-42′-00″; 118°-26′-03″. In 808 meters. OPG took 3.71 cuft fine mud.

R 2420. Sept. 29, 1953. 6.35 mi SW of Point Vincente light.
33°-40′-00″; 118°-30′-04″. In 848 meters. OPG took 3.15 cuft green mud.

R 2432. Oct. 10, 1953. 7.6 mi SW of Point Vincente light.
33°-40′-02″; 118°-32′-01″. In 834 meters. OPG took 3.59 cuft silty mud.

R 2474. Oct. 28, 1953. 8.1 mi W of Point Vincente light.
33°-46′-03″; 118°-34′-08″. In 751 meters. OPG took 3.9 cuft fine mud.

R 2475. Oct. 28, 1953. 6.2 mi W of Point Vincente light.
33°-44′-02″; 118°-32′-03″. In 686 meters. OPG took 3.21 cuft dark mud.

R 2476. Oct. 28, 1953. 4.5 mi W of Point Vincente light.
33°-44′-00″; 118°-29′-59″. In 715 meters. OPG took 0.95 cuft black mud, sand, and wood fragments.

R 2619. Apr. 7, 1954. 6.7 mi WSW of Point Vincente light.
33°-42′-02″; 118°-32′-01″. In 800 meters. OPG took 3.15 cuft gray-green mud.

R 2620. Apr. 7, 1954. 7.8 mi W of Point Vincente light.
33°-44′-02″; 118°-33′-59″. In 774 meters. OPG took 2.2 cuft gray-green mud.

R 2723, May 8, 1954. 4.8 mi WNW of Point Vincente light.
33°-46′-00″; 118°-30′-00″. In 602 meters. OPG took 3.4 cuft fine mud.

R 2725. May 8, 1954. 4.1 mi NNW of Palos Verdes Point.
33°-50′-00″; 118°-28′-00″. In 107 meters. OPG took 1.13 cuft coarse green mud.

R 2726. May 8, 1954. 5.1 mi NW of Palos Verdes Point.
33°-50′-00″; 118°-30′-00″. In 130 meters. OPG took 2.77 cuft green mud.

R 2727. May 8, 1954. 6.4 mi NW of Palos Verdes Point.
33°-50′-00″; 118°-32′-00″. In 122 meters. OPG took 1.76 cuft green mud.

R 2729. May 8, 1954. 9.5 mi W of Point Vincente light.
33°-45′-59″; 118°-35′-50″. In 825 meters. OPG took 3.4 cuft green mud.

R 2789. May 22, 1954. 7.8 mi WNW of Palos Verdes Point.
33°-49′-59″; 118°-34′-05″. In 167 meters. OPG took 1.7 cuft sandy blue-gray mud.

R 2790. May 22, 1954. 9.3 mi WNW of Palos Verdes Point.
33°-49′-58″; 118°-36′-00″. In 334 meters. OPG took 2.33 cuft blue-gray mud.

R 2791. May 22, 1954. 8.8 mi WNW of Palos Verdes Point.
33°-48′-00″; 118°-36′-03″. In 769 meters. OPG took 3.08 cuft blue-gray mud.

R 2792. May 22, 1954. 7.2 mi WNW of Palos Verdes Point.
33°-47′-59″; 118°-33′-59″. In 556 meters. OPG took 2.77 cuft blue-gray mud.

R 2793. May 22, 1954. 5.5 mi WNW of Palos Verdes Point.
33°-48′-00″; 118°-32′-00″. In 465 meters. OPG took 0.95 cuft blue-gray mud, some large rocks.

R 2794. May 22, 1954. 9.6 mi W of Palos Verdes Point.
33°-44′-02″; 118°-36′-00″. In 796 meters. OPG took 3.4 cuft blue-gray mud.

Ca 2847. June 23, 1954. West of Santa Catalina Island.
33°-22′-30″; 118°-36′-38″. In 914 meters. Campbell grab took 2.58 cuft sandy gray-green mud.

D 2965. October 30, 1954. In Santa Monica Bay.
33°-54′-23″; 118°-54′-11″. In 905 meters. Campbell grab took 3.3 cuft gray-green mud.

Mo 2999. February 6, 1955. 11.2 mi SW of Santa Monica pier.
33°-53′-11″; 118°-40′-00″. In 454 meters. OPG took 2.83 cuft gray-green mud.

Mo 3000. February 6, 1955. 8.2 mi SW of Santa Monica pier light.
33°-55′-12″; 118°-37′-30″. In 268 meters. OPG took 2.2 cuft sticky shelly debris, dark gray clay.

R 3163. June 25, 1955. 1.1 mi WSW of end of Redondo Beach pier.
33°-49′-53″; 118°-24′-39″. In 111 meters. OPG took only a very small sample from wall of canyon, gray mud stone.

R 3164. June 25, 1955. 1.05 mi WSW from Redondo Beach pier.
33°-49′-52″; 118°-24′-37″. In 148 meters. OPG took 2.83 cuft black mud.

R 3166. June 25, 1955. 5.5 mi WSW from Redondo Beach pier.
33°-49′-15″; 118°-27′-14″. In 363 meters. OPG took 2.52 cuft green mud.

R 3167. June 25, 1955. 6.1 mi WSW from Redondo Beach pier.
33°-48′-16″; 118°-29′-38″. In 519 meters. OPG took 1.95 cuft green mud.

R 3168. June 25, 1955. 7.7 mi WSW from Redondo Beach pier.
33°-47′-40″; 118°-32′-10″. In 554 meters. OPG took 2.08 cuft green mud.

R 3169. June 25, 1955. 9.4 mi WSW from Redondo Beach pier.
33°-46′-33″; 118°-33′-42″. In 706 meters. OPG took 1.95 cuft green mud.

Mo 3176. July 5, 1955. 9.75 mi SE of Point Dume.
33°-51′-58″; 118°-41′-57″. In 612 meters. OPG took 1.95 cuft green mud with sand, shaley debris and sponge.

Mo 3177. July 5, 1955. 8.75 mi SE of Point Dume.
33°-53′-26″; 118°-41′-36″. In 542 meters. OPG took 2.14 cuft green mud.

Mo 3178. July 5, 1955. 9.1 mi SE of Point Dume.
33°-54′-38″; 118°-39′-48″. In 431 meters. OPG took 2.33 cuft green-gray sticky mud.

Mo 3179. July 5, 1955. 8.2 mi WSW from Santa Monica pier light.
33°-55′-39″; 118°-38′-00″. In 362 meters. OPG took 2.01 cuft green-gray mud with $H_2S$.

Mo 3180. July 5, 1955. 7.1 mi SW from Santa Monica pier light.
33°-55′-30″; 118°-35′-55″. In 330 meters. OPG took 1.7 cuft green mud and silt; shale, pebbles, sticky green mud, rubble.

R 3385. Aug. 23, 1955. 7.4 mi SW of El Segundo pier.
33°-50′-00″; 118°-32′-23″. In 120 meters. OPG took 1.78 cuft fine sandy mud.

Mo 3399. Aug. 25, 1955. 11.7 mi WSW of El Segundo pier.
33°-52′-08″; 118°-39′-15″. In 463 meters. OPG took 2.58 cuft fine green sticky mud.

H 4846. Feb. 7, 1957. 1.8 mi 213.5° T from Port Hueneme light.
34°-07′-15″; 119°-13′-45″. In 209 meters. OPG took 3.15 cuft dark olive green silt.

Mu 4851. Feb. 7, 1957. 7.75 mi 134° T from Port Hueneme light.
34°-03′-30″; 119°-05′-55″. In 171 meters. OPG took 2.58 cuft fine olive green silty sand.

Mu 4852. Feb. 7, 1957. 6.4 mi 122° T from Port Hueneme light.
34°-05′-15″; 119°-05′-45″. In 15 meters. OPG took .88 cuft fine green sand in 2 lowerings.

N 5006. Apr. 23, 1957. 2.8 mi 285° T from Newport jetty light.
33°-36′-10″; 117°-56′-00″. In 37 meters. OPG took 2.52 cuft fine black silty sand.

D 5046. Apr. 25, 1957. 0.9 mi 176° T from Point Dume.
33°-59′-10″; 118°-48′-15″. In 398 meters. OPG took 3.15 cuft green sandy silt.

H 5114. June 6, 1957. 1.1 mi 218° T from Port Hueneme light.
34°-08′-00″; 119°-13′-20″. In 165 meters. OPG took 1.51 cuft gray medium sand.

H 5115. June 6, 1957. 3.55 mi 202° T from Port Hueneme light.
34°-05′-30″; 119°-14′-10″. In 373 meters. OPG took 2.39 cuft green and black silty sand, moderately sticky.

N 5250. Sept. 16, 1957. 2.8 mi 288° T from Newport jetty light.
33°-36′-14″; 117°-55′-54″. In 37 meters. OPG took 2.20 cuft black silt, slight $H_2S$.

N 5367. Nov. 5, 1957.
33°-35′-46″; 117°-55′-57″. In 97 meters. OPG took 3.15 cuft fine gray-green silty sand.

D 5505. Dec. 17, 1957. 1 mi from Point Dume.
33°-59′-15″; 118°-48′-15″. In 374 meters. OPG took 3.18 cuft fine gray-green silty sand.

H 5531. Dec. 18, 1957. 1.1 mi 216° T from Port Hueneme light.
34°-08′-00″; 119°-13′-15″. In 177 meters. OPG took 1.32 cuft green to black medium sand.

H 5532. Dec. 18, 1957. 3.7 mi 203° T from Port Hueneme light.
34°-05′-25″; 119°-14′-10″. In 376 meters. OPG took 1.95 cuft olive green silty sand, mud.

S 5639. Mar. 2, 1958. In San Pedro Sea Valley.
33°-37′-54″; 118°-18′-50″. In 461 meters. OPG took 0.7 cuft green mud, tar smell; many waxy lumps.

N 5661. Mar. 20, 1958. 2.65 mi 216.5° T from Newport jetty light.
33°-35′-35″; 117°-55′-58″. In 140 meters. OPG took 3.40 cuft black and dark green silty very coarse sand.

D 5674. Apr. 5, 1958. 1.85 mi 180.5° T from Point Dume.
33°-58′-17″; 118°-48′-27″. In 507 meters. OPG took 2.36 cuft green sandy mud.

D 5676. Apr. 5, 1958. 2.8 mi 195° T from Point Dume.
33°-57′-22″; 118°-49′-15″. In 652 meters. OPG took 3.30 cuft green sandy mud.

H 5686. Apr. 16, 1958. 3.7 mi 203° T from Port Hueneme light.
34°-05′-35″; 119°-14′-10″. In 374 meters. OPG took 0.18 cuft coarse sand covered with layer of fine brown silt.

H 5688. Apr. 16, 1958. 1.1 mi 222.5° T from Port Hueneme light.
34°-08′-00″; 119°-13′-18″. In 183 meters. OPG took 1.76 cuft dark gray silty sand with cover of brown silt.

R 5960. Nov. 22, 1958. 8.45 mi 230.5° T from Hyperion Stack.
33°-50′-18″; 118°-33′-50″. In 146 meters. OPG took 1.26 cuft dark olive green fine sand.

Mt 6490. Oct. 3, 1959. 9.1 mi 255° T from Moss Landing harbor light.
36°-45′-52″; 121°-58′-45″. In 906 meters. Campbell grab took 0.95 cuft mud, sand with some silt.

Mt 6494. Oct. 3, 1959. 7.1 mi 258.5° T from Moss Landing harbor light.
36°-46′-58″; 121°-55′-56″. In 750 meters. Campbell grab took 0.95 cuft coarse gray sand.

Mt 6497. Oct. 3, 1959. 5.25 mi 261.5° T from Moss Landing harbor light.
36°-47′-38″; 121°-53′-43″. In 410 meters. Campbell grab took 2.58 cuft olive green silt.

Mt 6498. Oct. 3, 1959. 3.1 mi 257°T from Moss Landing harbor light.
36°-47′-42″; 121°-51′-00″. In 260 meters. Campbell grab took 2.52 cuft black-gray silt.

Mt 6499. Oct. 3, 1959. 1.3 mi 251.5°T from Moss Landing harbor light.
36°-47′-57″; 121°-48′-47″. In 168 meters. Campbell grab took 2.20 cuft dark gray silt.

S 6501. Oct. 18, 1959. 2.8 mi 165°T from Point Fermin light.
33°-39′-34″; 118°-16′-47″. In 319 meters. Campbell grab took 4.30 cuft gray-green mud.

S 6502. Oct. 18, 1959. 3.4 mi 175°T from Point Fermin light.
33°-38′-48″; 118°-17′-15″. In 547 meters. Campbell grab took 5.74 cuft gray-green mud.

S 6503. Oct. 18, 1959. 3.3 mi 197°T from Point Fermin light.
33°-38′-36″; 118°-18′-58″. In 661 meters. Campbell grab took "large sample" gray-green mud.

R 6774. Dec. 19, 1959. 5.85 mi 275°T from Palos Verdes Point.
33°-47′-04″; 118°-32′-50″. In 660 meters. Campbell grab took 7.5 cuft sticky green mud.

R 6775. Dec. 19, 1959. 7.2 mi 271°T from Palos Verdes Point.
33°-46′-32″; 118°-34′-15″. In 786 meters. Campbell grab took "Large sample" sticky green mud.

Mo 6776. Dec. 19, 1959. 13.2 mi 279.5°T from Palos Verdes Point.
33°-48′-30″; 118°-41′-20″. In 873 meters. Campbell grab took 5.74 cuft green mud underlain by gray, dark gray and finally black mud.

Mo 6777. Dec. 19, 1959. 14.95 mi 290°T from Palos Verdes Point.
33°-51′-25″; 118°-42′-30″. In 810 meters. Campbell grab took 5.09 cuft green mud.

Mo 6778. Dec. 19, 1959. 15.5 mi 298.5°T from Palos Verdes Point.
33°-53′-53″; 118°-41′-55″. In 583 meters. Campbell grab took 4.80 cuft green silty clay.

Mo 6779. Dec. 19, 1959. 8.75 mi 235°T from Santa Monica pier light.
33°-55′-29″; 118°-38′-32″. In 475 meters. Campbell grab took 4.59 cuft green silt with clay and sand and coarse sand, partly gray.

Mo 6780. Dec. 20, 1959. 5.45 mi 211.5°T from Santa Monica pier light.
33°-55′-47″; 118°-33′-20″. In 183 meters. Campbell grab took 2.58 cuft dark-gray-black mud and green silty sand and mud.

Mo 6781. Dec. 20, 1959. 5.15 mi 208.5°T from Santa Monica pier light.
33°-55′-58″; 118°-32′-52″. In 116 meters. Campbell grab took 0.57 cuft sand and dark-gray-black, green silt.

Z 6803. Dec. 22, 1959. 2.4 mi 248°T from Kinton Point, Santa Cruz Isl.
33°-59′-32″; 119°-55′-55″. In 89 meters. Campbell grab took 0.26 cuft coarse shell sand.

Z 6804. Dec. 22, 1959. 1.05 mi 237°T from Gull Isl., Santa Cruz Channel.
33°-56′-25″; 119°-50′-32″. In 459 meters. Campbell grab took 1.14 cuft coarse brown shell sand.

Z 6805. Dec. 22, 1959. 2.3 mi 246.5°T from Gull Isl., Santa Cruz Channel.
33°-56′-03″; 119°-52′-03″. In 218 meters. Campbell grab took 3.59 cuft rocks and some green sand.

Z 6806. Dec. 22, 1959. 2.45 mi 249.5°T from Gull Isl., Santa Cruz Channel.
33°-56′-06″; 118°-52′-17″. In 221 meters. Campbell grab took 7.18 cuft rocks and green coarse sand.

Z 6808. Dec. 22, 1959. 3.05 mi 144.5°T from Gull Isl., Santa Cruz Channel.
33°-54′-30″; 119°-47′-22″. In 902 meters. Campbell grab took 4.80 cuft green sandy mud.

Z 6809. Dec. 22, 1959. 3.5 mi 132.5°T from Gull Isl., Santa Cruz Channel.
33°-54′-39″; 119°-46′-24″. In 623 meters. Campbell grab took 1.43 cuft gravel, round pebbles, brown-green mud.

Z 6810. Dec. 22, 1959. 5.15 mi 140°T from Gull Isl., Santa Cruz Channel.
33°-53′-00″; 119°-45′-32″. In 1387 meters. Campbell grab took 5.74 cuft green mud with sand layer and gravel.

Z 6811. Dec. 22, 1959. 6.85 mi 145.5°T from Gull Isl., Santa Cruz Channel.
33°-51′-20″; 119°-44′-53″. In 1624 meters. Campbell grab took 4.16 cuft olive green mud.

Z 6812. Dec. 22, 1959. 4.2 mi 130.5°T from Gull Isl., Santa Cruz Channel.
33°-54′-17″; 119°-45′-42″. In 676 meters. Campbell grab took 4.16 cuft olive green mud.

R 6815. Jan. 20, 1960. 2.95 mi 340°T from Palos Verdes Point.
33°-49′-14″; 118°-26′-54″. In 282 meters. Campbell grab took unknown volume gray mud.

R 6816. Jan. 20, 1960. 3 mi 337°T from Palos Verdes Point.
33°-49′-13″; 118°-27′-04″. In 378 meters. Campbell grab took 5.31 cuft dark gray to black mud.

R 6817. Jan. 20, 1960. 2.75 mi 299°T from Palos Verdes Point.
33°-47′-50″; 118°-28′-32″. In 76 meters. Campbell grab took unknown volume gray-green sand, some gravel.

Ca 6818. Jan. 27, 1960. 2.35 mi 183.5°T from Catalina Head.
33°-22′-53″; 118°-30′-57″. In 362 meters. Campbell grab took 2.87 cuft green mud and little coarse sand.

Ca 6819. Jan. 27, 1960. 2.35 mi 186.5°T from Catalina Head.
33°-22′-54; 118°-31′-07″. In 379 meters. Campbell grab took 3.66 cuft green mud.

Ca 6820. Jan. 27, 1960. 2.35 mi 208.5°T from Catalina Head.
33°-23′-11″; 118°-32′-11″. In 559 meters. Campbell grab took 4.16 cuft green mud.

Ca 6821. Jan. 27, 1960. 1.75 mi 211.5°T from Catalina Head.
33°-23′-46″; 118°-31′-57″. In 266 meters. Campbell grab took 2.72 cuft green mud.

Ca 6822. Jan. 27, 1960. 1.15 mi 163.5°T from Catalina Head.
33°-23′-10″; 118°-30′-01″. In 216 meters. Campbell grab took 3.94 cuft gray clayey mud.

Ca 6823. Jan. 27, 1960. 2.25 mi 156.5°T from Catalina Head, Santa Catalina Isl.
33°-23′-10″; 118°-29′-38″. In 94 meters. Campbell grab took unknown volume gray clayey mud.

Ca 6828. Jan. 28, 1960. 6.7 mi 215.5°T from Ribbon Rock.
33°-20′-30″; 118°-39′-05″. In 1272 meters. Campbell grab took 5.45 cuft green mud.

Ca 6829. Jan. 28, 1960. 3.65 mi 204°T from Ribbon Rock.
33°-22′-47″; 118°-36′-10″. In 853 meters. Campbell grab took ⅛ pint muddy sandstone.

Ca 6830. Jan. 28, 1960. 3.35 mi 176°T from Ribbon Rock.
33°-22′-58″; 118°-34′-00″. In 708 meters. Campbell grab took 1 pint green sandy mud and shale.

Ca 6831. Jan. 28, 1960. 2.25 mi 183.5°T from Ribbon Rock.
33°-23′-57″; 118°-34′-25″. In 549 meters. Campbell grab took 5.52 cuft green mud.

T 6832. Jan. 29, 1960. 28.9 mi 236°T from China Point light.
32°-33′-36″; 118°-55′-40″. In 1298 meters. Campbell grab took 2.72 cuft green mud.

T 6833. Jan. 29, 1960. 29.6 mi 250°T from China Point light.
32°-37′-54″; 118°-58′-40″. In 813 meters. Campbell grab took 0.34 cuft green muddy sand.

T 6834. Jan. 29, 1960. 31.5 mi 254°T from China Point light.
32°-39′-24″; 119°-01′-24″. In 603 meters. Campbell grab took 2.44 cuft green sandy mud.

T 6835. Jan. 29, 1960. 36.7 mi 253°T from China Point light.
32°-37′-061″; 119°-07-15″. In 298 meters. Campbell grab took 1.64 cuft coarse shell sand.

T 6836. Jan. 29, 1960. 35.3 mi 249°T from China Point light.
32°-36′-00″; 119°-05′-18″. In 496 meters. Campbell grab took 0.14 cuft green muddy sand with shale fragments.

T 6837. Jan. 29, 1960. 34.1 mi 246°T from China Point light.
32°-34′-36″; 119°-02′-48″. In 644 meters. Campbell grab took 2.65 cuft green muddy fine sand.

Cl 6838. Jan. 30, 1960. 2.9 mi 112°T from Pyramid Head light.
32°-48′-10″; 118°-17′-50″. In 950 meters. Campbell grab took 1½ gal. rocks, phosphorite, green sand.

Cl 6839. Jan. 30, 1960. 5.05 mi 123.5°T from Pyramid Head light.
32°-46′-30″; 118°-15′-43″. In 1406 meters. Campbell grab took 0.26 cuft green sand with rock and phosphorite.

Cl 6840. Jan. 30, 1960. 7.95 mi 123°T from Pyramid Head light.
32°-44′-35″; 118°-12′-45″. In 1620 meters. Campbell grab took small sample containing manganese nodules.

Cl 6841. Jan. 30, 1960. 8.2 mi 123°T from Pyramid Head light.
32°-44′-29″; 118°-12′-30″. In 1591 meters. Campbell grab took small sample green mud, gravel.

Co 6842. Jan. 31, 1960. 5 mi 223°T from North Coronado Island.
32°-22′-50″; 117°-22′-12″. In 1265 meters. Campbell grab took 5.23 cuft green silty mud.

Co 6844. Jan. 31, 1960. 3.6 mi 278.5°T from North Coronado Island.
32°-27′-00″; 118°-22′-18″. In 1105 meters. Campbell grab took 4.66 cuft green mud plus layer of clean sand, some gravel.

Co 6845. Feb. 1, 1960. 3.7 mi 013°T from North Coronado Island. 32°-30′-16″; 117°-16′-50″. In 177 meters. Campbell grab took 2.44 cuft green muddy sand.

Co 6846. Feb. 1, 1960. 3.85 mi 024°T from North Coronado Island. 32°-30′-15″; 117°-16′-04″. In 123 meters. Campbell grab took 0.71 cuft green muddy sand and gray sand.

Co 6849. Feb. 1, 1960. 3.95 mi 353.5°T from North Coronado Island. 32°-30′-58″; 117°-17′-34″. In 344 meters. Campbell grab took 5.74 cuft green mud, gray mud with $H_2S$ smell.

Co 6850. Feb. 1, 1960. 4.75 mi 306°T from North Coronado Island. 32°-29′-48″; 117°-22′-58″. In 960 meters. Campbell grab took 3.87 cuft green mud.

Co 6851. Feb. 1, 1960. 4.65 mi 322.5°T from North Coronado Island. 32°-30′-42″; 117°-21′-37″. In 812 meters. Campbell grab took 5.52 cuft green mud.

Co 6852. Feb. 1, 1960. 4.7 mi 357°T from North Coronado Island. 32°-31′-20″; 117°-20′-12″. In 566 meters. Campbell grab took sample of green sandy mud.

S 6854. Feb. 13, 1960. 2.55 mi 159.5°T from Point Fermin light. 33°-39′-45″; 118°-16′-28″. In 187 meters. Campbell grab took 5.74 cuft sticky dark gray mud.

S 6861. Feb. 14, 1960. 4 mi 211°T from Point Fermin light. 33°-38′-40″; 118°-20′-10″. In 716 meters. Campbell grab took 5.74 cuft green oily-smelling mud.

H 6896. Mar. 11, 1960. 1.7 mi 032°T from Port Hueneme light. 34°-07′-18″; 119°-13′-43″. In 271 meters. Campbell grab took 2.29 cuft gray coarse sand, gray mud.

H 6897. Mar. 11, 1960. 2.55 mi 020.5°T from Port Hueneme light. 34°-06′-14″; 119°-13′-44″. In 338 meters. Campbell grab took 2.29 cuft gray sand and mud, 2 large pieces of tar.

H 6898. Mar. 11, 1960. 3.7 mi 018.5°T from Port Hueneme light. 34°-05′-00″; 119°-13′-55″. In 373 meters. Campbell grab took 5.16 cuft dark gray mud, partly sticky; some $H_2S$.

H 6899. March 11, 1960. 4.8 mi from Port Hueneme light. 34°-03′-55″; 119°-14′-28″. In 456 meters. Campbell grab took 2.15 cuft gray muddy sand, mud, pebbles, gravel, some Miocene shaley limestone.

H 6900. March 11, 1960. 5.75 mi from Port Hueneme light. 34°-03′-00″; 119°-14′-28″. In 478 meters. Campbell grab took 5.02 cuft green mud, gray silty sand.

H 6901. March 11, 1960. 5.2 mi from Anacapa Island light. 34°-01′-00″; 119°-15′-00″. In 621 meters. Campbell grab took 3.65 cuft gray sand.

Mu 6902. March 11, 1960. 1.45 mi from Point Mugu. 34°-05′-20″; 119°-05′-22″. In 119 meters. Campbell grab took 1.07 cuft dark gray coarse sand, pebbles and gravel.

Mu 6903. March 11, 1960. 2.15 mi from Point Mugu. 34°-04′-42″; 119°-06′-12″. In 352 meters. Campbell grab took 1.07 cuft gray sand, gray sticky mud, black mud.

Mu 6904. March 11, 1960. 1.95 mi from Point Mugu. 34°-03′-45″; 119°-05′-12″. In 475 meters. Campbell grab took one quart gray sand, some gravel.

H 6905. March 12, 1960. 0.55 mi from Port Hueneme breakwater light. 34°-08′-30″; 119°-13′-00″. In 98 meters. Campbell grab took 1.29 cuft gray coarse sand.

Mu 6909. March 12, 1960. 3.25 mi from Point Mugu. 34°-01′-50″; 119°-02′-30″. In 352 meters. Campbell grab took 2 gallons gray sticky mud, green muddy silt, some gravel.

Mu 6910. March 12, 1960. 3.1 mi from Point Mugu.
34°-02′-13″; 119°-05′-05″. In 548 meters. Campbell grab took 5.74 cuft green and gray mud.

Mu 6911. March 12, 1960. 4.2 mi from Point Mugu.
34°-01′-00″; 119°-05′-35″. In 644 meters. Campbell grab took 2.44 cuft green muddy silt.

Mu 6912. March 12, 1960. 5.5 mi from Point Mugu.
33°-59′-20″; 119°-04′-23″. In 721 meters. Campbell grab took 5.16 cuft gray mud, green mud, gray muddy silt, sandy silt.

Mu 6913. March 12, 1960. 6.5 mi from Point Mugu.
33°-58′-30″; 119°-01′-44″. In 792 meters. Campbell grab took 5.74 cuft green mud.

D 6915. March 13, 1960. 0.65 mi from Point Dume.
33°-59′-25″; 118°-48′-40″. In 299 meters. Campbell grab took 4.38 cuft dark gray mud.

D 6916. March 13, 1960. 1.6 mi from Point Dume.
33°-58′-30″; 118°-48′-15″. In 530 meters. Campbell grab took 5.31 cuft green mud.

D 6917. March 13, 1960. 2.85 mi from Point Dume.
33°-57′-12″; 118°-49′-00″. In 711 meters. Campbell grab took 5.88 cuft green mud.

D 6918. March 13, 1960. 4.0 mi from Point Dume.
33°-56′-25″; 118°-50′-48″. In 741 meters. Campbell grab took 4.8 cuft green mud.

N 7028. May 5, 1960. 2.1 mi from base of Newport pier.
33°-34′-13″; 117°-55′-28″. In 272 meters. Campbell grab took 0.57 cuft gray sandy silt.

N 7029. May 5, 1960. 1.3 mi from base of Newport pier.
33°-35′-05″; 117°-55′-45″. In 170 meters. Campbell grab took 5.38 cuft gray silt.

N 7030. May 5, 1960. 0.7 mi from base of Newport pier.
33°-35′-43″; 117°-55′-54″. In 85 meters. Campbell grab took 5.38 cuft gray sandy mud.

N 7031. May 5, 1960. 0.2 mi from base of Newport pier.
33°-36′-24″; 117°-55′-54″. In 16 meters. Campbell grab took 2.51 cuft gray and green sandy silt, sand and some gravel.

N 7032. May 5, 1960. 4.75 mi from base of Newport pier.
33°-31′-28″; 117°-54′-58″. In 478 meters. Campbell grab took 1.14 cuft green mud and gray sand, partly very coarse sand.

J 7038. May 6, 1960. 1.6 mi from Point La Jolla.
32°-52′-48″; 117°-16′-32″. In 121 meters. Campbell grab took 3.94 cuft green-gray muddy silt and black mud.

J 7039. May 6, 1960. 2.0 mi from Point La Jolla.
32°-53′-12″; 117°-17′-00″. In 371 meters. Campbell grab took 0.26 cuft gray silt and sand.

J 7040. May 6, 1960. 6.8 mi from Point La Jolla.
32°-54′-42″; 117°-23′-38″. In 637 meters. Campbell grab took 3.3 cuft clean dark gray sand, a little muddy sand.

J 7041. May 6, 1960. 6.35 mi from Point La Jolla.
32°-54′-02″; 117°-23′-30″. In 545 meters. Campbell grab took 5.59 cuft green mud.

J 7043. May 7, 1960. 0.45 mi from Point La Jolla.
32°-51′-23″; 117°-15′-55″. In 135 meters. Campbell grab took 1.0 cuft gray, partly coarse sand and some pebbles.

J 7044. May 7, 1960. 1.4 mi from Point La Jolla.
32°-52′-21″; 117°-15′-27″. In 79 meters. Campbell grab took 2.58 cuft gray muddy sand.

J 7045. May 7, 1960. 0.95 mi from Point La Jolla.
32°-52′-06″; 117°-16′-24″. In 274 meters. Campbell grab took 0.49 cuft gray sand.

J 7046. May 7, 1960. 4.0 mi from Point La Jolla.
32°-54′-18″; 117°-19′-44″. In 517 meters. Campbell grab took 1.21 cuft gray sand, green mud.

J 7047. May 7, 1960. 10.8 mi from Point La Jolla.
32°-54′-21″; 117°-29′-53″. In 793 meters. Campbell grab took 1.07 cuft green silty mud, with sand.

J 7048. May 7, 1960. 10.2 mi from Point La Jolla.
32°-52′-43″; 117°-29′-11″. In 708 meters. Campbell grab took 5.74 cuft green mud.

J 7049. May 7, 1960. 14.85 mi from Point La Jolla.
32°-49′-37″; 117°-35′-12″. In 976 meters. Campbell grab took 2.51 cuft gray sand and green mud.

N 7050. May 8, 1960. 6.8 mi from Abalone Point.
33°-26′-27″; 117°-52′-00″. In 642 meters. Campbell grab took 0.64 cuft gray sand, some green mud.

N 7051. May 8, 1960. 4.95 mi from Abalone Point.
33°-29′-36″; 117°-53′-44″. In 553 meters. Campbell grab took 0.49 cuft clean gray sand under an inch of green mud.

N 7052. May 8, 1960. 5.0 mi from base of Newport pier.
33°-31′-10″; 117°-56′-08″. In 420 meters. Campbell grab took 3.59 cuft green mud and gravel.

N 7053. May 8, 1960. 3.5 mi from base of Newport pier.
33°-32′-45″; 117°-55′-22″. In 396 meters. Campbell grab took 0.42 cuft gray sand, some green mud.

N 7054. May 8, 1960. 1.95 mi from base of Newport pier.
33°-34′-23″; 117°-55′-48″. In 178 meters. Campbell grab took 3.73 cuft gray-green mud, gray sticky clay, some gravel.

N 7055. May 8, 1960. 0.6 mi from base of Newport pier.
33°-35′-53″; 117°-56′-02″. In 76 meters. Campbell grab took 2.29 cuft dark gray sandy mud.

S 7155. Sept. 29, 1960. 4.2 mi from Pt. Fermin light.
33°-38′-08″; 118°-18′-20″. In 468 meters. Campbell grab took unknown volume of mud.

S 7160. Oct. 8, 1960. 3.1 mi from Pt. Fermin light.
33°-39′-14″; 118°-16′-54″. In 406 meters. Campbell grab took 4.8 cuft green sand and mud.

S 7174. Oct. 9, 1960. 3.8 mi from Pt. Fermin light.
33°-38′-36″; 118°-16′-16″. In 221 meters. Campbell grab took full sample of mud.

S 7175. Oct. 9, 1962. 2.45 mi 186°T from Point Fermin light.
Biol. Dredge. Start 33°-39′-34″; 118°-18′-12″, finish 33°-40′-06″; 118°-17′-32″. In 200-572 m. green mud.

R 7284. Feb. 9, 1961. 1.0 mi from Redondo Beach pier.
33°-49-53″; 118°-24′-31″. In 137 meters. Campbell grab took 3.59 cuft black mud.

R 7285. Feb. 9, 1961. 3.4 mi from Palos Verdes Point.
33°-49′-52″; 118°-25′-38″. In 246 meters. Campbell grab took 5.59 cuft black mud.

R 7286. Feb. 9, 1961. 3.1 mi from Palos Verdes Point.
33°-49′-22″; 118°-26′-54″. In 378 meters. Campbell grab took 2.5 cuft gray-green mud and clean gray sand.

R 7287. Feb. 9, 1961. 3.0 mi from Palos Verdes Point.
33°-48′-45″; 118°-27′-53″. In 431 meters. Campbell grab took 4.73 cuft gray-green mud and clean sand.

R 7288. Feb. 9, 1961. 3.6 mi from Palos Verdes Point.
33°-48′-29″; 118°-29′-14″. In 503 meters. Campbell grab took 3.01 cuft gray-green mud and clean gray sand.

R 7289. Feb. 9, 1961. 4.5 mi from Palos Verdes Point.
33°-48′-14″; 118°-30′-50″. In 560 meters. Campbell grab took 2.29 cuft green mud and very coarse sand.

R 7290. Feb. 9, 1961. 5.35 mi from Palos Verdes Point.
33°-27′-35″; 118°-26′-58″. In 611 meters. Campbell grab took 4.3 cuft green mud.

SD 7395. Aug. 22, 1961. 14.7 mi from Dana Point.
33°-13′-55″; 117°-48′-30″. In 846 meters. Campbell grab took unknown volume green mud.

SD 7396. Aug. 22, 1961. 14.8 mi from Dana Point.
33°-13′-15″; 117°-46′-25″. In 840 meters. Campbell grab took unknown volume sand and green mud.

SD 7399. Aug. 22, 1961. 14.45 mi from Dana Point.
33°-13′-10″; 117°-44′-02″. In 844 meters. Campbell grab took unknown volume sand and green mud.

SD 7402. Aug. 23, 1961. 6.7 mi from Dana Point.
33°-21′-40″; 117°-46′-15″. In 768 meters. Campbell grab took unknown volume sand.

SD 7403. Aug. 23, 1961. 7.55 mi from Dana Point.
33°-21′-22″; 117°-47′-50″. In 734 meters. Campbell grab took unknown volume green mud, small amount sand.

SD 7404. Aug. 23, 1961. 8.5 mi from Dana Point.
33°-20′-47″; 117°-48′-55″. In 686 meters. Campbell grab took unknown volume green mud.

S 7498. Dec. 17, 1961. 9.5 mi 024°T from Long Point, Santa Catalina Island.
33°-33′-03″; 118°-17′-16″. In 740 meters. Campbell grab took unknown volume green mud.

Mo 7517. Jan. 16, 1962. 9.5 mi 147°T from Point Dume.
33°-52′-15″; 118°-42′-00″. In 680+ meters. Campbell grab took unknown volume green mud and sand.

D 7520. Jan. 16, 1962. 2.25 mi 186°T from Point Dume buoy.
33°-57′-20″; 118°-48′-35″. In 622 meters. Campbell grab took unknown volume green mud with $H_2S$.

Mu 7521. Jan. 16, 1962. 9.5 mi 235°T from Point Dume.
33°-57′-16″; 118°-59′-25″. In 914 meters. Campbell grab took unknown volume green mud.

H 7523. Jan. 17, 1962. 6.9 mi 058.5°T from Anacapa Island light.
34°-04′-31″; 119°-14′-35″. In 470 meters. Campbell grab took unknown volume gray-green mud.

N 7728. April 10, 1962. 7.3 mi 192.5°T from Dana Point.
33°-20′-30″; 117°-44′-52″. In 786 meters. Campbell grab took unknown volume green mud.

N 7729. April 11, 1962. 1.4 mi 176.5°T from base of Newport Beach pier.
33°-35′-02″; 117°55′-43″. In 216 meters. Campbell grab took unknown volume gray mud.

N 7730. April 11, 1962. 1.55 mi 176.5°T from base of Newport Beach pier.
33°-34′-54″; 117°-55′-33″. In 236 meters. Campbell grab took unknown volume coarse gray sand and gray mud.

## ANALYSES

Analyses of samples from Station numbers, arranged from longshore, north, Monterey, to south, Coronado, and from offshore, Santa Cruz to Tanner canyons. Each station is indicated with depth in meters, kind of sediment, gear used to recover the sample, volume of sample in cuft (shipboard measurement), and weight of macroscopic animals in grams (laboratory weight). Species are named by phylogenetic groups, including Polychaetes, Echinoderms, Mollusks, Crustaceans, and others. Total numbers of species and specimens are summarized by station number. Characteristics of the screenings, after the fine, silty fractions have been removed, are briefly stated. The largest species and the most conspicuous or abundant kinds are listed.

## MONTEREY CANYON

| | | | | | |
|---|---|---|---|---|---|
| Station number | 6499 | 6498 | 6497 | 6494 | 6490 |
| Depth in meters | 168 | 260 | 410 | 750 | 906 |
| Kind of sediment | silt | silt | silt | coarse sand | mud, sand |
| Gear used | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.2 | 2.52 | 2.58 | 0 95 | 0.95 |
| Wt. of animals, gms. | 71.6 | 233.9 | 237.3 | 2 5 | negl |
| **POLYCHAETES** | | | | | |
| *Ancistrosyllis tentaculata* | 4 | | | | |
| *Asychis disparidentata* | 10 | | | | |
| *Brada pluribranchiata* | 2 | | 4 | | |
| *Chloeia pinnata* | 36 | 14 | | | |
| *Disoma franciscanum* | 1 | | 2 | | 1 |
| *Eulalia*, 3-lined | 1 | | | | |
| *Glycera capitata* | 7 | | ?1 | 2 jv | |
| *Harmothoë* sp. | 2 | 7 | | | |
| *Heteromastus filobranchus* | 153 | 47 | | 2 | 7 |
| *Lepidasthenia* sp. | 6 | | | | |
| *Lumbrineris index* | 3 | | | | |
| *Magelona ?pacifica* | 4 | | | | |
| *Maldane*, nr *sarsi* | 10 | | 165 | | |

## MONTEREY CANYON *(Continued)*

| Station number | 6499 | 6498 | 6497 | 6494 | 6490 |
|---|---|---|---|---|---|
| Depth in meters | 168 | 260 | 410 | 750 | 906 |
| Kind of sediment | silt | silt | silt | coarse sand | mud, sand |
| Gear used | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.2 | 2.52 | 2.58 | 0.95 | 0.95 |
| Wt. of animals, gms. | 71.6 | 233.9 | 237.3 | 2.5 | negl. |
| **POLYCHAETES** | | | | | |
| *Nereis procera* | 4 | 2 | | | ?1 lg |
| *Nothria iridescens* | 5 | | 34 | | |
| *Owenia* sp. | 2 | | | | |
| *Paraonis gracilis* | 2 | 3 | 14 | | |
| *Pectinaria californiensis* | 43 | 16 | 1 | | |
| *Pholoë glabra* | 2 | | | | |
| *Pilargis berkeleyi* | 1 | | | | |
| *Prionospio pinnata* | 5 | ?1 | | | |
| *Sternaspis fossor* | 32 | | | | |
| *Streblosoma crassibranchia* | 1 | 1 | | | |
| *Amaeana occidentalis* | | 1 | | | |
| *Barantolla* sp. | | 8 | | | |
| *Chaetozone* sp. | | 1 | | | |

## MONTEREY CANYON *(Continued)*

| Station number | 6499 | 6498 | 6497 | 6494 | 6490 |
|---|---|---|---|---|---|
| Depth in meters | 168 | 260 | 410 | 750 | 906 |
| Kind of sediment | silt | silt | silt | coarse sand | mud, sand |
| Gear used | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.2 | 2.52 | 2.58 | 0.95 | 0.95 |
| Wt. of animals, gms | 71.6 | 233.9 | 237.3 | 2.5 | negl |
| **POLYCHAETES** | | | | | |
| *Lepidametria* sp. | | 5 | | | |
| *Neoheteromastus lineus* | | 1 | | | |
| *Nephtys assignis* | | 1 | 5 | | |
| *Nothria pallida* | | 17 | | | |
| *Rhodine bitorquata* | | 1 | | | |
| *Brada pilosa* | | | 1 | | |
| *Hesperonoë ?laevis* | | | 5 | | |
| *Prionospio cirrifera* | | | 1 | | |
| *Spiophanes* sp. | | | 1 | | |
| *Tharyx tesselata* | | | 5 | | |
| *Capitella capitata* subspp. | | | | 5 | |
| *Nephtys cornuta* | | | | 17 | |
| | | | | | |

## MONTEREY CANYON *(Continued)*

| | | | | | |
|---|---|---|---|---|---|
| Station number | 6499 | 6498 | 6497 | 6494 | 6490 |
| Depth in meters | 168 | 260 | 410 | 750 | 906 |
| Kind of sediment | silt | silt | silt | coarse sand | mud, sand |
| Gear used | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.2 | 2.52 | 2.58 | 0.95 | 0.95 |
| Wt. of animals, gms. | 71.6 | 233.9 | 237.3 | 2.5 | negl. |
| **ECHINODERMS** | | | | | |
| *Amphioplus strongyloplax* | 2 | | | | |
| *Brisaster townsendi* | 2 | 4 lg | 6 lg | | |
| *Amphiura arcystata* | | 1 | | | |
| ophiuroid | | | 3 | 1 sm | |
| **MOLLUSKS** | | | | | |
| *Dentalium rectius* | 5 | present | 16 | | |
| *Cyathodonta* sp. | 1 | | | | |
| *Pandora filosa* | 1 | | | | |
| sea slug, post. incised | 3 | | | | |
| solenogasters | | 4 | 7 | | |
| *Amphissa* sp. | | | 20 | | |
| *Saxicavella pacifica* | | | 6 | | |
| small clam | | | | 1 sm | |

## MONTEREY CANYON *(Continued)*

| | | | | | |
|---|---|---|---|---|---|
| Station number | 6499 | 6498 | 6497 | 6494 | 6490 |
| Depth in meters | 168 | 260 | 410 | 750 | 906 |
| Kind of sediment | silt | silt | silt | coarse sand | mud, sand |
| Gear used | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.2 | 2.52 | 2.58 | 0.95 | 0.95 |
| Wt. of animals, gms. | 71 6 | 233.9 | 237.3 | 2.5 | negl. |
| **MOLLUSKS** | | | | | |
| ?*Bittium*-like snail | | | | 1 sm | |
| **CRUSTACEANS** | | | | | |
| amphipods | 32 | 3 | 5 | | |
| *Protomedeia* sp. | | | | 121 | 21 |
| cumaceans | | | | | |
| *Eudorella pacifica* | 1 | 3 | | | |
| *Diastylis pellucida* | | 1 | 13 | 17 | |
| *Leucon subnasica* | | 5 | | | |
| *Diastylis* sp. | | | 1 | | |
| *Campylaspis* sp. | | | 1 | | |
| *Leucon*, nr *subnasica* | | | 1 | 140 | |
| ostracod | | 1 | | | |
| idotheid isopod | | | | 1 | |

## MONTEREY CANYON *(Continued)*

| Station number | 6499 | 6498 | 6497 | 6494 | 6490 |
|---|---|---|---|---|---|
| Depth in meters | 168 | 260 | 410 | 750 | 906 |
| Kind of sediment | silt | silt | silt | coarse sand | mud, sand |
| Gear used | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.2 | 2 52 | 2 58 | 0.95 | 0 95 |
| Wt. of animals, gms. | 71.6 | 233.9 | 237 3 | 2.5 | negl |
| **CRUSTACEANS** | | | | | |
| copepod, commensal | 1 | | | | |
| pinnixid crab | 3 | 1 | | | |
| shrimp, fragment | | | | 1 | |
| **OTHERS** | | | | | |
| anemone | 1 | 1 | | | |
| enteropneust | 3 | | | | |
| nemertean | 5 | | 1 | | |
| phoronid | 3 | | | | |
| echiuroid | | 23 lg | 4 lg | | |
| sipunculid | | | 1 | | |
| hydroid | | | | trace | |
| | | | | | |
| | | | | | |

## MONTEREY CANYON *(Continued)*

| | | | | | |
|---|---|---|---|---|---|
| Station number | 6499 | 6498 | 6497 | 6494 | 6490 |
| Depth in meters | 168 | 260 | 410 | 750 | 906 |
| Kind of sediment | silt | silt | silt | coarse sand | mud, sand |
| Gear used | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.2 | 2.52 | 2.58 | 0.95 | 0.95 |
| Wt. of animals, gms. | 71 6 | 233.9 | 237.3 | 2.5 | negl. |
| **NUMBERS OF** | | | | | |
| **POLYCHAETES** Species | 23 | 16 | 13 | 4 | 3 |
| Specimens | 336 | 126 | 239 | 26 | 9 |
| **ECHINODERMS** Species | 2 | 2 | 2 | 1 | 0 |
| Specimens | 4 | 5 | 9 | 1 | 0 |
| **MOLLUSKS** Species | 4 | 2 | 4 | 2 | 0 |
| Specimens | 10 | 5 | 49 | 2 | 0 |
| **CRUSTACEANS** Species | 4+ | 6 | 5 | 5 | 1 |
| Specimens | 37 | 14 | 21 | 280 | 21 |
| **OTHERS** Species | 4 | 2 | 3 | 0 | 0 |
| Specimens | 12 | 24 | 6 | 0 | 0 |
| **TOTALS** Species | 37+ | 28 | 27 | 12 | 4 |
| Specimens | 399 | 174 | 324 | 309 | 30 |

## MONTEREY CANYON *(Continued)*

| Station number . . . . . | 6499 | 6498 | 6497 | 6494 | 6490 |
|---|---|---|---|---|---|
| Characteristics of the screenings | muddy tubes and worm-like animals | muddy tubes and worms | dead shells of *Dentalium*, *Amphissa*, onuphid tubes | woody debris, coarse sand, worms | plant debris, small animals |
| Largest species | *Asychis disparidentata*, enteropneust | echiuroid | ?*Arhynchite*, *Brisaster* | none | none |
| Most conspicuous or abundant species | *Asychis disparidentata*, *Heteromastus filobranchus* | echiuroid | echinoids echiuroids | none | cumaceans, amphipods |

# HUENEME CANYON

| Station number | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 98 | 165 | 177 | 183 | 209 | 271 | 338 | 373 | 373 | 376 | 397 | 456 | 478 | 621 |
| Kind of sediment | sand | sand | sand | sand, silt | silt | sand, mud | sand, mud | mud | sand | sand | mud | mixed | mud, sand | sand |
| Gear used | CG | OPG | OPG | OPG | OPG | CG | CG | CG | OPG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.29 | 1.51 | 1.32 | 1.76 | 3.15 | 2.29 | 2.29 | 5.16 | 2.39 | 1.95 | 3.0 | 2.15 | 5.02 | 3.65 |
| Wt. of animals, gms. | negl. | 15.1 | 156.4 | 183.1 | 99.5 | 2.8 | 9.0 | 406.9 | 77.4 | 65.4 | 318.6 | 2.5 | 143.8 | negl |
| **POLYCHAETES** | | | | | | | | | | | | | | |
| *Amaeana occidentalis* | 1 | | | | | | | | | | | | | |
| *Eteone californica* | 2 | | | 1 | | | | | | | | | | |
| *Glycera americana* | 1 | 1 lg | 2 | | | | 1 | | | | | 2 | | |
| *Goniada brunnea* | 1 | | | | | 3 | 3 | 2 | | 9 lg | 5 | | | |
| *Haploscoloplos elongatus* | 3 | 103 | 32 | 2 | 4 | 2 jv | | | | | 2 | 1 | | |
| *Heteromastus filobranchus* | 4 | 26 | 225 | 245 | 45 | | 2 | 11 | 3 | 8 sm | 9 | | 9 | |
| *Lumbrineris californiensis* | 4 | | | | | | | | | | | | | |
| *Nephtys caecoides* | ?5 | | | | | | | | | | | | | |
| *Notomastus lineatus* | ?3 | | | | | | | | | | | | | |
| *Pholoë glabra* | 1 | | | | 1 | | 1 | | | | | 1 jv | | |
| *Scalibregma inflatum* | 2 jv | | | | | | | | | | | | | |
| *Spiophanes bombyx* | 1 | | | | | | | | | | | | | |
| *Lumbrineris* spp. | 2 | | | | 1 | 1 | 2 sm | | | | | | | |

## HUENEME CANYON *(Continued)*

| Station number | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 98 | 165 | 177 | 183 | 209 | 271 | 338 | 373 | 373 | 376 | 397 | 456 | 478 | 621 |
| Kind of sediment | sand | sand | sand | sand, silt | silt | sand, mud | sand, mud | mud | sand | sand | mud | mixed | mud, sand | sand |
| Gear used | CG | OPG | OPG | OPG | OPG | CG | CG | CG | OPG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.29 | 1.51 | 1.32 | 1.76 | 3.15 | 2.29 | 2.29 | 5.16 | 2.39 | 1.95 | 3.0 | 2.15 | 5.02 | 3.65 |
| Wt. of animals, gms. | negl. | 15.1 | 156.4 | 183.1 | 99.5 | 2.8 | 9.0 | 406.9 | 77.4 | 65.4 | 318.6 | 2.5 | 143 8 | negl |
| **POLYCHAETES** | | | | | | | | | | | | | | |
| *Asychis disparidentata* | | 1 | 3 | | 3 | | | | | | | | | |
| *Chloeia pinnata* | | 10 lg | 6 | | | | 5 | | | 12 lg | 8 | | | |
| *Cossura pygodactylata* | | 1 | 54 | | | | | | | | | | | |
| *Eteone dilatae* | | 10 | 7 | | | | | | | | | | | |
| *Ninoë gemmea* | | 1 | 1 | | | | | | | | | | | |
| *Oxydromus a. glabrus* | | 2 | | 1 | | | | | | | 1 | | | |
| *Pectinaria californiensis* | | 65 | 2 | | 16 | | 84 | 200+ | 123 | 24 | 10 | 1 jv | | |
| *Prionospio malmgreni* | | 5 | | | | | 2 | | | | | 1 | | |
| *Prionospio pinnata* | | 16 | 14 | 4 | | | 3 | 2 jv | 2 | 2 | 6 | 2 | | |
| *Tharyx tesselata* | | 1 | | | | | | | | | | | | |
| *Anaitides madeirensis* | | | 1 | | | | | | | 13 | | | | |
| *Ancistrosyllis tentaculata* | | | 1 | 2 | 2 | | 1 | | | | | 1 | | |
| *Glycera capitata* | | | 3 | 1 | | | 1 | | | | ?1 jv | ?1 | | |

## HUENEME CANYON *(Continued)*

| Station number | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 98 | 165 | 177 | 183 | 209 | 271 | 338 | 373 | 373 | 376 | 397 | 456 | 478 | 621 |
| Kind of sediment | sand | sand | sand | sand, silt | silt | sand, mud | sand, mud | mud | sand | sand | mud | mixed | mud, sand | sand |
| Gear used | CG | OPG | OPG | OPG | OPG | CG | CG | CG | OPG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.29 | 1.51 | 1.32 | 1.76 | 3.15 | 2.29 | 2.29 | 5.16 | 2.39 | 1.95 | 3.0 | 2.15 | 5.02 | 3.65 |
| Wt. of animals, gms. | negl. | 15.1 | 156.4 | 183.1 | 99.5 | 2.8 | 9.0 | 406.9 | 77.4 | 65.4 | 318.6 | 2.5 | 143.8 | negl |
| **POLYCHAETES** | | | | | | | | | | | | | | |
| *Glycinde polygnatha* | | | ?2 | | | | | | | | | | | |
| *Hesperonoë laevis* | | | 12+ | | | | | | 3 | | | | | |
| *Lepidasthenia* sp. | | | 1 | | | | | | | | | | | |
| *Lumbrineris cruzensis* | | | 1 | | | | | | | | | 1- | | |
| *Lumbrineris*, nr *sarsi* | | | 3 | | | | | | | | | | | |
| *Mediomastus californiensis* | | | 18 | | | | | | | | | | | |
| *Nephtys ferruginea* | | | 2 sm | | | | 3 | | | 2 | | 3 | | |
| *Nothria elegans* | | | 1 | | | | | | | | | | | |
| *Ophiodromus pugettensis* | | | 2 | | | | | | | | | | | |
| *Praxillella a. pacifica* | | | 1 | | | | | | | | | | | |
| *Prionospio cirrifera* | | | ?26 | 3 | | | | | 6 | | | | | |
| *Travisia gigas* | | | 1 | | | | | | | | | | | |
| *Axiothella rubrocincta* | | | | 2 | | | | | | | | | | |

## HUENEME CANYON *(Continued)*

| Station number | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 98 | 165 | 177 | 183 | 209 | 271 | 338 | 373 | 373 | 376 | 397 | 456 | 478 | 621 |
| Kind of sediment | sand | sand | sand | sand, silt | silt | sand, mud | sand, mud | mud | sand | sand | mud | mixed | mud, sand | sand |
| Gear used | CG | OPG | OPG | OPG | OPG | CG | CG | CG | OPG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.29 | 1.51 | 1.32 | 1.76 | 3.15 | 2.29 | 2.29 | 5.16 | 2.39 | 1.95 | 3.0 | 2.15 | 5.02 | 3.65 |
| Wt. of animals, gms. | negl. | 15.1 | 156.4 | 183.1 | 99.5 | 2.8 | 9.0 | 406.9 | 77.4 | 65.4 | 318.6 | 2.5 | 143.8 | negl. |
| **POLYCHAETES** | | | | | | | | | | | | | | |
| *Chone infundibuliformis* | | | | 1 | | | | | | | | | | |
| *Glycera robusta* | | | | 1 | | | | | | | | | | |
| *Nothria* sp. | | | | 2 | | | 1 | | | | | | | |
| *Amage anops* | | | | | ?1 | | | | | | | | | |
| *Harmothoë* sp. | | | | | 1 | | | | | | 7 | | | |
| *Laonice foliata* | | | | | 1 | | | 1 | | 1 | | | | |
| *Nephtys* spp. | | | | | 3+ | | | 2 jv | 2 jv | | 9 jv | 12 | | |
| *Nothria pallida* | | | | | 46 | | | 40+ | | | | | | |
| *Paraonis gracilis* or var. | | | | | 1 | | | 3 | 10 | | 6 | | | |
| *Pilargis maculata* | | | | | 1 | | | | | | | | | |
| *Pista disjuncta* | | | | | 20 | | | many | | | | | | |
| *Travisia pupa* | | | | | 1 | | | | | | 1 lg | | | |
| *Mediomastus glabrus* | | | | | | 1 | | | | | | | | |

## HUENEME CANYON *(Continued)*

| Station number | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 98 | 165 | 177 | 183 | 209 | 271 | 338 | 373 | 373 | 376 | 397 | 456 | 478 | 621 |
| Kind of sediment | sand | sand | sand | sand, silt | silt | sand, mud | sand, mud | mud | sand | sand | mud | mixed | mud, sand | sand |
| Gear used | CG | OPG | OPG | OPG | OPG | CG | CG | CG | OPG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.29 | 1.51 | 1.32 | 1.76 | 3.15 | 2.29 | 2.29 | 5.16 | 2.39 | 1.95 | 3.0 | 2.15 | 5 02 | 3 65 |
| Wt. of animals, gms. | negl. | 15.1 | 156.4 | 183.1 | 99.5 | 2.8 | 9.0 | 406.9 | 77.4 | 65.4 | 318.6 | 2.5 | 143 8 | negl |
| **POLYCHAETES** | | | | | | | | | | | | | | |
| *Oxydromus* sp. | | | | | | 1 | | | 1 | 1 | | | 1 | |
| *Prionospio* sp. | | | | | | 1 jv | | | | | | | | |
| *Capitella capitata oculata* | | | | | | | 1 | | | | | 52 | | |
| *Myriochele gracilis* | | | | | | | 4 | ?3 | 5 | | 27 | | | |
| *Lumbrineris bicirrata* | | | | | | | 1 lg | | | 1 lg | | | | |
| *Sternaspis fossor* | | | | | | | 1 | | | | | | | |
| *Spiophanes* sp. | | | | | | | 1 | | | | | | | |
| *Terebellides* sp. | | | | | | | 1 jv | | | | | | | |
| *Brada pluribranchiata* | | | | | | | | 2 | | 5 | | | | |
| *Amphiduros*, nr *pacificus* or sp. | | | | | | | | 1- | | | | | | |
| *Lumbrineris simplicis* | | | | | | | | 2 lg | | | | | | |
| *Maldane ?sarsi* | | | | | | | | 2 jv | | | 3 jv | | | |
| *Melinna heterodonta* | | | | | | | | 1 | 1 | 1 | 1 lg | | | |

## HUENEME CANYON *(Continued)*

| Station number | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 98 | 165 | 177 | 183 | 209 | 271 | 338 | 373 | 373 | 376 | 397 | 456 | 478 | 621 |
| Kind of sediment | sand | sand | sand | sand, silt | silt | sand, mud | sand, mud | mud | sand | sand | mud | mixed | mud, sand | sand |
| Gear used | CG | OPG | OPG | OPG | OPG | CG | CG | CG | OPG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.29 | 1.51 | 1.32 | 1.76 | 3.15 | 2.29 | 2.29 | 5.16 | 2.39 | 1.95 | 3.0 | 2.15 | 5.02 | 3.65 |
| Wt. of animals, gms. | negl. | 15.1 | 156.4 | 183.1 | 99.5 | 2.8 | 9.0 | 406.9 | 77.4 | 65.4 | 318.6 | 2.5 | 143.8 | negl. |
| **POLYCHAETES** | | | | | | | | | | | | | | |
| *Nereis procera* | | | | | | | | ?1 | | | | | | |
| *Onuphis vexillaria* | | | | | | | | 30+ | 2+ | 2 | 6 | | 4 | |
| *Amphicteis* sp. | | | | | | | | | 1 | | | | | |
| *Cossura* sp. | | | | | | | | | 2 | | | | | |
| *Goniada annulata* | | | | | | | | | 2 | | | | | |
| *Onuphis eremita* | | | | | | | | | 1 | | | | | |
| *Owenia* sp. | | | | | | | | | 5 jv | | | 2 jv | | |
| *Nothria iridescens* | | | | | | | | | 6 | 23 | 42 lg | 2 jv | | |
| *Dorvillea articulata* or sp. | | | | | | | | | | 1 | | | 1 | |
| *Nephtys glabra* | | | | | | | | | | 1 | | | | |
| *Spiophanes fimbriata* | | | | | | | | | | ca 150 | | | | |
| *Aglaophamus* sp. | | | | | | | | | | | 1 | | | |
| *Anaitides* cf. *groenlandica* | | | | | | | | | | | 1 | | | |

## HUENEME CANYON *(Continued)*

| Station number | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 98 | 165 | 177 | 183 | 209 | 271 | 338 | 373 | 373 | 376 | 397 | 456 | 478 | 621 |
| Kind of sediment | sand | sand | sand | sand, silt | silt | sand, mud | sand, mud | mud | sand | sand | mud | mixed | mud, sand | sand |
| Gear used | CG | OPG | OPG | OPG | OPG | CG | CG | CG | OPG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.29 | 1.51 | 1.32 | 1.76 | 3.15 | 2.29 | 2.29 | 5.16 | 2.39 | 1.95 | 3.0 | 2.15 | 5.02 | 3.65 |
| Wt. of animals, gms. | negl | 15.1 | 156.4 | 183.1 | 99.5 | 2.8 | 9.0 | 406.9 | 77.4 | 65.4 | 318.6 | 2.5 | 143.8 | negl |
| **POLYCHAETES** | | | | | | | | | | | | | | |
| *Ancistrosyllis breviceps* | | | | | | | | | | | 1 | | | |
| *Aricidea lopezi* | | | | | | | | | | | 1 sm | | | |
| *Eunice americana* | | | | | | | | | | | 1 | | | |
| *Glycera tenuis* | | | | | | | | | | | 2 | | | |
| *Aphrodita refulgida* | | | | | | | | | | | | 1 | | |
| *Eteone* sp. | | | | | | | | | | | | 6 | | |
| *Lanice* sp. | | | | | | | | | | | | pres | | |
| *Isocirrus* sp. | | | | | | | | | | | | ?1- | | |
| *Axiothella* sp. | | | | | | | | | | | | | 4 | |
| *Dorvillea* sp. | | | | | | | | | | | | | 1 | |
| *Goniada* sp. | | | | | | | | | | | | | 3 | |
| *Spiophanes pallidus* | | | | | | | | | | | | | 2 | |

## HUENEME CANYON *(Continued)*

| Station number | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 98 | 165 | 177 | 183 | 209 | 271 | 338 | 373 | 373 | 376 | 397 | 456 | 478 | 621 |
| Kind of sediment | sand | sand | sand | sand, silt | silt | sand, mud | sand, mud | mud | sand | sand | mud | mixed | mud, sand | sand |
| Gear used | CG | OPG | OPG | OPG | OPG | CG | CG | CG | OPG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.29 | 1.51 | 1.32 | 1.76 | 3.15 | 2.29 | 2.29 | 5.16 | 2.39 | 1.95 | 3.0 | 2.15 | 5.02 | 3.65 |
| Wt. of animals, gms. | negl. | 15.1 | 156.4 | 183.1 | 99.5 | 2.8 | 9.0 | 406.9 | 77.4 | 65.4 | 318.6 | 2.5 | 143.8 | negl. |
| **ECHINODERMS** | | | | | | | | | | | | | | |
| *Amphiodia urtica* | 3 sm | | 14 | 3 | 4 | 1 | 2 | 4 | | | | | | |
| *Amphipholis pugetana* | 3 | | | | | | | | | | | | | |
| *Amphipholis squamata* | | | 2 | | | | 5 | 1 | | | | | | |
| *Brisaster townsendi* | | | | | 1 | | | 8 | | | 20 lg | | 1 lg | |
| *Brissopsis pacifica* | | | | | | | | 1 | | | | | 5 lg | |
| ophiuroids | | | | | | | | | | | 5 sm | | | |
| *Amphiura seminuda* | | | | | | | | | | | | | 1 | |
| **MOLLUSKS** | | | | | | | | | | | | | | |
| snail, small | 1 | | | | | | | | | | | | | |
| ?*Aglaja* sp. | 4 | | | | 1 | | 1 | | 1 | | | | | |
| *Parvilucina tenuisculpta* | | ?1 | | | | | | | | | | | | |
| *Cylichnella diegensis* | | | 47 | 1 | | | | | | | | | | |
| *Acila castrensis* | | | 4 | | | | | | | | | | | |

## HUENEME CANYON *(Continued)*

| Station number | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 98 | 165 | 177 | 183 | 209 | 271 | 338 | 373 | 373 | 376 | 397 | 456 | 478 | 621 |
| Kind of sediment | sand | sand | sand | sand, silt | silt | sand, mud | sand, mud | mud | sand | sand | mud | mixed | mud, sand | sand |
| Gear used | CG | OPG | OPG | OPG | OPG | CG | CG | CG | OPG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.29 | 1.51 | 1.32 | 1.76 | 3.15 | 2.29 | 2.29 | 5.16 | 2.39 | 1.95 | 3.0 | 2.15 | 5.02 | 3.65 |
| Wt. of animals, gms. | negl. | 15.1 | 156.4 | 183.1 | 99.5 | 2.8 | 9.0 | 406.9 | 77.4 | 65.4 | 318.6 | 2.5 | 143.8 | negl. |
| **MOLLUSKS** | | | | | | | | | | | | | | |
| *Axinopsida serricatus* | | | 2 | | | | | | | | | | | |
| *Saxicavella pacifica* | | | 99 | | | | | | 9 | 12 | | | | |
| *Rochefortia tumida* | | | | 1 | | | | | | | | | | |
| *Bittium* sp. | | | | | 8 | | | | | | 25 | | | |
| *Dentalium rectius* | | | | | 47 | | | | | | 4 jv | | 5 | |
| *Yoldia ensifera* | | | | | 12 | | | | | | | | 1 | |
| *Cyathodonta* sp. | | | | | | 2 lg | 1 | | | | | | | |
| turret-top shell | | | | | | 1+ | | | | | | | | |
| gastropods, various | | | | | | | | many | | | pres | | | |
| pelecypods, small | | | | | | | | | | | pres | | | |
| solenogasters | | | | | | | | 2 | | 1 | 3 | | | |
| *Crystallophrisson* spp. | | | | | | | | | | | 11 | | | |
| *Prochaetoderma* sp. | | | | | | | | | | | 1 | | | |

## HUENEME CANYON *(Continued)*

| Station number | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 98 | 165 | 177 | 183 | 209 | 271 | 338 | 373 | 373 | 376 | 397 | 456 | 478 | 621 |
| Kind of sediment | sand | sand | sand | sand, silt | silt | sand, mud | sand, mud | mud | sand | sand | mud | mixed | mud, sand | sand |
| Gear used | CG | OPG | OPG | OPG | OPG | CG | CG | CG | OPG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.29 | 1.51 | 1.32 | 1.76 | 3.15 | 2.29 | 2.29 | 5.16 | 2.39 | 1.95 | 3.0 | 2.15 | 5.02 | 3.65 |
| Wt. of animals, gms. | negl. | 15.1 | 156.4 | 183.1 | 99.5 | 2.8 | 9.0 | 406.9 | 77.4 | 65.4 | 318.6 | 2.5 | 143.8 | negl. |
| **MOLLUSKS** | | | | | | | | | | | | | | |
| *Epitonium*, sp. | | | | | | | | | 1 | | | | ?1 | |
| *Amphissa* sp. | | | | | | | | | 1 | | dd | 2 | 1 | |
| *Cardita* sp. | | | | | | | | | | | | 1 jv | | |
| *Calliostoma* sp. | | | | | | | | | | | | 2 | | |
| *Cadulus* sp. | | | | | | | | | 1 | | dd | | 1 | |
| **CRUSTACEANS** | | | | | | | | | | | | | | |
| caprellid | | | | | | | | | 1 | | 3 | | | |
| amphipods | | | | | | | 11 | | 2 | | | 10 | 3 | |
| lysianassid | | 4 | | | 1 | | | | | | | | | |
| *Paraphoxus epistomus* | | 1 | | | | | | | | | | | | |
| *Paraphoxus similis* | | 1 | | | | | | | | | | | | |
| photid | | 1 | | | | | | | | | | | | |
| pontogeneiid | | 1 | | | | | | | | | | | | |

## HUENEME CANYON *(Continued)*

| Station number | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 98 | 165 | 177 | 183 | 209 | 271 | 338 | 373 | 373 | 376 | 397 | 456 | 478 | 621 |
| Kind of sediment | sand | sand | sand | sand, silt | silt | sand, mud | sand, mud | mud | sand | sand | mud | mixed | mud, sand | sand |
| Gear used | CG | OPG | OPG | OPG | OPG | CG | CG | CG | OPG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.29 | 1.51 | 1.32 | 1.76 | 3.15 | 2.29 | 2.29 | 5.16 | 2.39 | 1.95 | 3.0 | 2.15 | 5.02 | 3.65 |
| Wt. of animals, gms | negl. | 15.1 | 156.4 | 183.1 | 99.5 | 2.8 | 9.0 | 406.9 | 77.4 | 65.4 | 318.6 | 2.5 | 143.8 | negl. |
| **CRUSTACEANS** | | | | | | | | | | | | | | |
| *Heterophoxus oculatus* | | | 4 | | | | | | | 2 | | | | |
| *Paraphoxus bicuspidatus* | | | 1 | | | | | | | 1 | | | | |
| gammarid | | | 1 | | | | | | | | | | | |
| *Cyathura* sp. | | | | 1 | | | | | | | | | | |
| *Listriella eriopsis* | | | | | 1 | | | | | | | | | |
| cumaceans | | | | 1 | | 1 | 14 | | | | | 21 | | |
| *Eudorella* sp. | | 1 | | | | | | | | | | | | |
| *Diastylis pellucida* | | | | | | | | | | | 2 | | | |
| *Leucon subnasica* | | | | | | | | | 2 | | | | | |
| *Leucon*, nr. *subnasica* | | | | | | | | | | | 52 | 12 | | |
| *Campylaspis* sp. | | | | | | | | | | | 2 | | | |
| *Leucon* sp. | | | | | | | | | | | | 1 | | |
| mysid shrimp | | 5 | | | | | | | | | | | | |

## HUENEME CANYON *(Continued)*

| Station number | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 98 | 165 | 177 | 183 | 209 | 271 | 338 | 373 | 373 | 376 | 397 | 456 | 478 | 621 |
| Kind of sediment | sand | sand | sand | sand, silt | silt | sand, mud | sand, mud | mud | sand | sand | mud | mixed | mud, sand | sand |
| Gear used | CG | OPG | OPG | OPG | OPG | CG | CG | CG | OPG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.29 | 1.51 | 1.32 | 1.76 | 3.15 | 2.29 | 2.29 | 5.16 | 2.39 | 1.95 | 3.0 | 2.15 | 5.02 | 3.65 |
| Wt. of animals, gms. | negl. | 15.1 | 156.4 | 183.1 | 99.5 | 2.8 | 9.0 | 406.9 | 77.4 | 65.4 | 318.6 | 2.5 | 143.8 | negl. |
| **CRUSTACEANS** | | | | | | | | | | | | | | |
| small crabs | | 11 jv | | | | | | | | | | | | |
| pinnixid crabs | | | 3 | 1 | | | | | | 1 | | | | |
| *Callianassa*, or ghost shrimp | | | | | | | 1 | | | | | | 2 | |
| **OTHERS** | | | | | | | | | | | | | | |
| hydroid stems | 3 | 1 | | | | 2 | | | | | | | 1 | |
| encrusting bryozoans | pres | | | | | | | | | | | | | |
| nemertean | 1 sm | | | | | | | | | | | | | |
| polyclad | 1 sm | | | | | | | | | | | | | |
| *Branchiostoma* sp. | | 1 | | | | | | | | | | | | |
| nemertean, *Cerebratulus* sp. | | | 3 | 4 lg | | | | 2 | | 2 | 2 lg | | 1 | |
| echiuroid, *Listriolobus pelodes* | | | 75 | 3 | | | | | | | | | | |
| phoronid | | | 1 | | | | | | | | | | | |
| nemertean, diffuse green | | | | 4 | | | | | | | | | | |

## HUENEME CANYON *(Continued)*

| Station number | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 98 | 165 | 177 | 183 | 209 | 271 | 338 | 373 | 373 | 376 | 397 | 456 | 478 | 621 |
| Kind of sediment | sand | sand | sand | sand, silt | silt | sand, mud | sand, mud | mud | sand | sand | mud | mixed | mud, sand | sand |
| Gear used | CG | OPG | OPG | OPG | OPG | CG | CG | CG | OPG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.29 | 1.51 | 1.32 | 1.76 | 3.15 | 2.29 | 2.29 | 5.16 | 2.39 | 1.95 | 3.0 | 2.15 | 5.02 | 3.65 |
| Wt. of animals, gms. | negl. | 15.1 | 156.4 | 183.1 | 99.5 | 2.8 | 9.0 | 406.9 | 77.4 | 65.4 | 318.6 | 2.5 | 143.8 | negl. |
| **OTHERS** | | | | | | | | | | | | | | |
| sipunculid, ?*Golfingia* sp. | | | | | 2 | | | | | | | | | |
| *Monobrachium*, colony | | | | | | | 1 | | | | | | | |
| thalassemid, *Arhynchite* sp. | | | | | | | | 1 | 2 lg | 2 | | | | |
| sipunculid | | | | | | | | 1 | | 1 | | | | |
| anemone | | | | | | | | | 9 | | 4 | | | |
| oligochaete, prickly epithelium | | | | | | | | | | | 5 | | | |
| ceriantharian | | | | | | | | | | 1 lg | | | | |

## HUENEME CANYON *(Continued)*

| Station number | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 98 | 165 | 177 | 183 | 209 | 271 | 338 | 373 | 373 | 376 | 397 | 456 | 478 | 621 |
| Kind of sediment | sand | sand | sand | sand, silt | silt | sand, mud | sand, mud | mud | sand | sand | mud | mixed | mud, sand | sand |
| Gear used | CG | OPG | OPG | OPG | OPG | CG | CG | CG | OPG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.29 | 1.51 | 1.32 | 1.76 | 3.15 | 2.29 | 2.29 | 5.16 | 2.39 | 1.95 | 3.0 | 2.15 | 5.02 | 3.65 |
| Wt. of animals, gms. | negl. | 15.1 | 156.4 | 183.1 | 99.5 | 2.8 | 9.0 | 406.9 | 77.4 | 65.4 | 318.6 | 2.5 | 143.8 | negl |
| **NUMBERS OF POLYCHAETES** Species | 13 | 12 | 25 | 13 | 16 | 6 | 19 | 16+ | 17 | 18 | 21+ | 13 | 7 | 0 |
| Specimens | 30 | 232 | 424 | 272 | 147 | 9 | 118 | 303+ | 175 | 254 | 135 | 83 | 24 | 0 |
| **ECHINODERMS** Species | 2 | 0 | 2 | 1 | 2 | 1 | 1 | 4 | 0 | 0 | 2 | 0 | 3 | 0 |
| Specimens | 6 | 0 | 16 | 3 | 5 | 1 | 4 | 14 | 0 | 0 | 25 | 0 | 7 | 0 |
| **MOLLUSKS** Species | 2 | 1 | 4 | 2 | 4 | 2 | 2 | 1+ | 6 | 2 | 7 | 4 | 5 | 0 |
| Specimens | 5 | 1 | 152 | 2 | 68 | 3+ | 2 | 2+ | 17 | 13 | ca 50 | 8 | 9 | 0 |
| **CRUSTACEANS** Species | 0 | 8 | 4 | 2 | 2 | 1 | 4 | 0 | 3 | 3 | 4 | 6+ | 2 | 0 |
| Specimens | 0 | 25 | 9 | 2 | 2 | 1 | 27 | 0 | 5 | 4 | 59 | 47 | 5 | 0 |
| **OTHERS** Species | 3+ | 2 | 3 | 3 | 1 | 1 | 1 | 3 | 2 | 4 | 3 | 0 | 2 | 0 |
| Specimens | 5+ | 2 | 79 | 11 | 2 | 2 | 1 | 4 | 11 | 6 | 11 | 0 | 2 | 0 |
| **TOTALS** Species | 20+ | 23 | 38 | 21 | 25 | 11 | 27 | 24+ | 28 | 27 | 37+ | 23+ | 19 | 0 |
| Specimens | 46+ | 260 | 680 | 290 | 224 | 16+ | 152 | 323+ | 209 | 277 | 280 | 138 | 47 | 0 |

## HUENEME CANYON *(Continued)*

| Station number . . . . . | 6905 | 5114 | 5531 | 5688 | 4846 | 6896 | 6897 | 6898 | 5115 | 5532 | 7523 | 6899 | 6900 | 6901 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Character of screenings | 0.6 qt. gray sand, flocculent debris, dead *Phyllospadix* | silty sand with *Pectinaria* tubes | silt with *Listriolobus* and other animals | silt with worms | silt with worms | flocculent plant detritus, gravel | gray sand, worms | *Brisaster*, onuphid tubes, worms | silt, worms | silt, worms | - - - | flocculent detritus, black sticks, very small worms | brissopsids, shells of *Dentalium*, *Amphissa*, flocculent debris | gray sand, dead shells of *Dentalium* |
| Largest species | none | *Glycera americana* | *Asychis*, *Listriolobus* | *Cerebratulus*, *Listriolobus*, *Glycera robusta* | *Brisaster*, *Yoldia*, *Asychis*, *Travisia* | *Cyathodonta* | *Cyathodonta* | *Brisaster* | ?*Arhynchite* | *Arhynchite*, *Nephtys glabra* | - - - | none | brissopsids, *Onuphis vexillaria* | nr dead |
| Most abundant or conspicuous species | none | *Pectinaria*, *Haploscoloplos* | *Heteromastus*, *Listriolobus* | *Heteromastus filobranchus* | *Dentalium*, *Nothria*, *Pecinaria*, *Pista*, *Heteromastus* | none | *Pectinaria* | *Pectinaria*, *Nothria* | *Pectinaria*, *Nothria* | *Spiopanes*, *Pectinaria* | - - - | *Capitella* | none | nr dead |

## MUGU CANYON

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **POLYCHAETES** | | | | | | | | | | |
| *Ampharete arctica* | 2 | | | | 1 | | | | | |
| *Amphicteis scaphobranchiata* | 2 | | 3 | | | | | | | |
| *Anotomastus gordiodes* | 3 | | | | | | | | | |
| *Aricidea lopezi* | 2 | | | | | | | | | |
| *Aricidea*, nr *suecica* | 4 | | | | | | | | | |
| *Autolytus*, speckled | 2 | | | | | | | | | |
| *Axiothella* sp. | 6 | | | | | | | | | |
| *Chaetozone corona* | 19 | | | | | | | | | |
| *Chaetozone spinosa* | 2 | | | | | | | | | |
| *Chone gracilis* | 11 | | | | | | | | | |
| *Chone infundibuliformis* | 1 | | | | | | | | | |
| *Diopatra ornata* | 25 lg | | | | | | | | | |
| *Drilonereis* sp. | 1 | | | | | | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **POLYCHAETES** | | | | | | | | | | |
| *Eteone californca* | 2 | | | | | | | | | |
| ?*Euchone* sp. | 1 | | | | | | | | | |
| *Eulalia* sp. | 1 | | | | | | | | | |
| *Eumida sanguinea* | 1 | | 1 | | | | | | | |
| *Exogone* sp. | 3 | | | | | | | | | |
| ?*Genetyllis* sp. | 2 | | | | | | | | | |
| *Glycera americana* | 1 | | | | | | | | | |
| *Glycera convoluta* | 2 | | | | | | | | | |
| *Goniada acicula* | 1 | | | | | | | | | |
| *Goniada brunnea* | 7 | 1 | | 3 | | 8 | | | | |
| *Haploscoloplos elongatus* | 13 | | | 3 | 1 | | | | | |
| *Harmothoë priops* | 2 | | | | | | | | | |
| *Harmothoë*, other sp. | 1 | | 5 | | 2 | | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **POLYCHAETES** | | | | | | | | | | |
| *Laonice ?cirrata* | 5 | | | | | | | | | |
| *Lumbrineris californiensis* | 2 lg | | | | | | | | | |
| *Lumbrineris* spp. | 32 | | 8 | | | 2 jv | | 1 | | |
| *Magelona pacifica* | 7 jv | | | | | | | | | |
| *Magelona sacculata* | 21 | | 1 | | | | | | | |
| *Mediomastus californiensis* | 10 | | | | | | | | | |
| *Maldane sarsi* | 1 | | 58 | | 1 | | 1 | | | |
| *Nephtys caecoides* | 3 | | | | | | | | | |
| *Nephtys ferruginea* | 1 | | | 4 jv | 4 jv | | | | | |
| *Nephtys* sp. | 2 jv | | | | | 1 jv | 1 jv | | | |
| *Nereis procera* | 8 | | 1 | | | | | | | |
| *Nothria* sp. | 4 | | | | | | | | | |
| *Owenia f. collaris* | 1 | | 58 jv | | | | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **POLYCHAETES** | | | | | | | | | | |
| *Paraonis gracilis* | 1 | | 2 | | 1 | | | | | |
| *Pholoë glabra* | 3 | | 13 | | | | | | | |
| *Phyllodoce* or phyllodocid | 3 | | 1 frg | | | | | | | |
| *Pista disjuncta* | 12 | | 2 | | | | | | | |
| *Platynereis bicanaliculata* | 4 | | | | | | | | | |
| *Poecilochaetus johnsoni* | 3 | | | | | | | | | |
| *Phyllochaetopterus limicolus* | 3 | | 1 | 1 lg | | | | | | |
| *Pherusa papillata* | 2 | | | | 1 | | | | | |
| *Polydora* sp. | 2 | | | | | | | | | |
| *Praxillella* sp. | 1 | | 3 | | | | | | | |
| *Prionospio malmgreni* | 34 | | 5 | | | | | | | |
| *Prionospio pinnata* | 4 | | 15 | 5 | | | | | | |
| *Schistocomus hiltoni* | 4 | | | | | | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **POLYCHAETES** | | | | | | | | | | |
| *Sphaerosyllis* sp. | 5 | | | | | | | | | |
| *Spiophanes bombyx* | 2 | | | | | | | | | |
| *Spiophanes missionensis* | 4 | | 3 | | | | | | | |
| *Sthenelais tertiaglabra* | 2 | | | | | | | | | |
| *Sthenelais verruculosa* | 1 | | | | | | | | | |
| *Streblosoma crassibranchia* | 3 | | | | | | | | | |
| *Telepsavus costarum* | 6 | | | | | | | | | |
| *Thalenessa spinosa* | 12 | | | | | | | | | |
| *Tharyx tesselata* | 71 | | 12 | | | | | | | |
| *Typosyllis* spp. | 25 | | | | | | | | | |
| *Capitella capitata subsp.* | | 9 | | | | | | | | |
| *Lumbrineris cruzensis* | | 2 | | | | | | | | |
| *Ninoë gemmea* | | 1 | | | | | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **POLYCHAETES** | | | | | | | | | | |
| *Scalibregma inflatum* | | 1 jv | | | | | | | | |
| *Amage anops* | | | 6 | | | | | | | |
| *Ammotrypane aulogaster* | | | 1 | | | | | | | |
| *Ancistrosyllis breviceps* | | | 1 | | | | | | | |
| *Aricidea (C.) aciculata* | | | 1 | | | | | | | |
| *Axiothella rubrocincta* | | | 18 | | | | | | | |
| *Brada pluribranchiata* | | | 4 | | | | | | | |
| *Ceratocephala c. americana* | | | 1 | | | | | | | |
| *Chloeia pinnata* | | | 39 | | 27 | | 10 lg | | | |
| *Cossura sp.* | | | 2 | | | | | | | |
| *Glycera capitata* | | 1 | 1 | 4 | 1 | | | | | |
| *Hesperonoë laevis* | | | 2 | ?4 | | | | | | |
| *Heteromastus filobranchus* | | | 2 | 18 | | 71 | ?3 | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **POLYCHAETES** | | | | | | | | | | |
| *Myriochele gracilis* | | | 4 | | 2 jv | | | | | |
| *Myriowenia californiensis* | | | 1 | | | | | | | |
| *Nephtys glabra* | | | 10 | | | | | | | |
| *Nothria iridescens* | | | 25 | 5 lg | 6 | | | | | |
| *Onuphis parva* | | | 22 | 1 | | | | | | |
| *Pectinaria californiensis* | | | 25 | | 19 | 1 | | | | |
| *Polycirrus ?californicus* | | | 2 | | | | | | | |
| *Rhodine bitorquata* | | | 31 | | | | | | | |
| *Syllis* sp. | | | 1 | | | | | | | |
| *Sternaspis fossor* | | | 7 | | | | | | | |
| *Terebellides stroemi* | | | 1 | | | | | | | |
| *Tharyx monilaris* | | | 2 | | | | | 1 | | |
| *Travisia pupa* | | | 1 | | | | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **POLYCHAETES** | | | | | | | | | | |
| *Spiophanes fimbriata* | | | | 3 | | | | | | |
| *Antinoella* sp. | | | | 1 | | 6 | | | | |
| *Eunice americana* | | | | | 3 | | | | | |
| *Notomastus tenuis* | | | | | 1 | | | | | |
| *Onuphis vexillaria* | | | | | 1 jv | 2 lg | | | | |
| *Praxillella a. pacifica* | | | | | 1 | | | | | |
| *Tharyx* spp. | | | | | 2 jv | | | | | |
| *ampharetid* | | | | | | 1 | | | | |
| *Ancistrosyllis breviceps* | | | | | | 1 | | | | |
| *Ancistrosyllis tentaculata* | | | | | | 4 | | | | |
| *Brada pilosa* | | | | | | ?15 | 3 | | | |
| euclymenid | | | | | | 1 | | | | |
| *Glycera c. branchiopoda* | | | | | | 1 | 3 | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **POLYCHAETES** | | | | | | | | | | |
| *Oxydromus* sp. | | | | | | 8 | | 2 | | |
| *Spiophanes pallidus* | | | | | | 2 | 8 | | | |
| ?*Anobothrus gracilis* | | | | | | | 6 | | | |
| *Lumbrineris* ?*longensis* | | | | | | | 3 jv | 3 | | |
| *Decamastus gracilis* | | | | | | | 15+ | | | |
| *Aricidea uschakowi* | | | | | | | | 3 | | |
| *Califia calida* | | | | | | | | 1 | | |
| *Spiophanes* sp. | | | | | | | | 10 | | |
| *Myriochele* sp. | | | | | | | | 1 | | |
| ?*Notomastus* sp. | | | | | | | | 1 | | |
| **ECHINODERMS** | | | | | | | | | | |
| *Amphiodia urtica* | 10 | | 7 | | 28 | | | | | |
| *Amphioplus hexacanthus* | 1 | | | | | | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **ECHINODERMS** | | | | | | | | | | |
| *Amphipholis squamata* | 4 | 1 jv | 3 | | | | | 1 | | |
| *Ophiothrix spiculata* | 4 | | | | | | | | | |
| *Astropecten californicus* | 2 jv | | | | | | | | | |
| *Leptosynapta albicans* | 1 | | | | | | | | | |
| *Dendraster excentricus* | | 1 jv | | | | | | | | |
| *Amphiodia digitata* | | | 8 | | | | | | | |
| *Amphioplus strongyloplax* | | | 15 | | | | | | | |
| *Brisaster townsendi* | | | 2 | | 2 | | 1 | | | |
| *Amphiodia occidentalis* | | | | 1 | | | | | | |
| *Amphipholis pugetana* | | | | | 17 | | | | | |
| *Amphiura arcystata* | | | | | 2 | | | | | |
| *Ophiacantha abnormis* | | | | | | frag. | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **MOLLUSKS** | | | | | | | | | | |
| *Balcis rutila* | ?1 | | | | | | | | | |
| *Crepidula* sp. | 1 | | | | | | | | | |
| ?*Mitrella* sp. | 1 | | | | | | | | | |
| nudibranch | 1 | | | | | | | | | |
| *Acila castrensis* | 1 | | 68 | | | | | | | |
| *Cardita ventricosa* | 1 | | 8 | | | | | | | |
| *Chlamys latiauratus* | ?7 | | | | | | | | | |
| *Lucinisca nuttallii* | 2 | | | | | | | | | |
| *Modiolus neglectus* | 2 | | | | | | | | | |
| *Solen* sp. | ca 6 | | | | | | | | | |
| *Tellina carpenteri* | 11 | | 3 | | | | | | | |
| other mollusks | 5 | | 1 | 2 | | | 5 | | | |
| *Cylichnella* sp. | | 1 | | | | | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **MOLLUSKS** | | | | | | | | | | |
| *Mitrella* sp. | | 1 | | | | | | | | |
| solenogasters | | | 1 | | | 3 | 1 | 5 | | |
| *Carinoturris adristia* | | | 2 | | | | | | | |
| *Colus* sp. | | | 1 | | | | | | | |
| *Odostomia* sp. | | | 2 | | | | | | | |
| *Adontorhina cyclia* | | | 7 | | | | | | | |
| *Amygdalum pallidulum* | | | 3 | | | | | | | |
| *Axinopsida serricatus* | | | 75 | | | | | | | |
| *Nucula tenuis* | | | 2 | | | | | | | |
| *Rochefortia ?aleutica* | | | 2 | | | | | | | |
| *Saxicavella pacifica* | | | 2 | 5 | | 2 | | | | |
| *Dentalium ?rectius* | | | 37 | | | | | | | |
| *Nassarius perpinguis* | | | | 1 | | | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **MOLLUSKS** | | | | | | | | | | |
| *Siliqua* sp. | | | | 1 | | | | | | |
| *Crystallophrisson* sp. | | | | 1 | | | | | | |
| *Prochaetoderma* sp. | | | | 1 | | | | | | |
| clam, small white | | | | 1 | | | | | | |
| *Cadulus* sp. | | | | 1 | | | | | | |
| **CRUSTACEANS** | | | | | | | | | | |
| amphipods | | | | 5 | 8 | 8 | 1+ | 2 | | |
| *Ampelisca cristata* | 30 | | | | | | | | | |
| *Ampelisca macrocephala* | 2 | | 46 | | | | | | | |
| *Ampithoe* sp. | 1 | | | | | | | | | |
| *Aruga oculata* | 1 | | | | | | | | | |
| *Aoroides columbiae* | 195 | | | | | | | | | |
| *Ericthonius brasiliensis* | 4 | | 1 | | | | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **CRUSTACEANS** | | | | | | | | | | |
| *Eurystheus thompsoni* | 5 | | | | | | | | | |
| *Listriella melanica* | 7 | | | | | | | | | |
| *Ischyrocerus* sp. | 36 | | | | | | | | | |
| oedicerotid | 1 | | | | | | | | | |
| *Parapleustes pugettensis* | 89 | | | | | | | | | |
| *Photis californica* | 31 | | | | | | | | | |
| *Photis* sp. | 27 | | 7 | | | | | | | |
| *Paraphoxus obtusidens* | 34 | | | | | | | | | |
| *Paraphoxus spinosus* | 19 | | | | | | | | | |
| *Paraphoxus epistomus* | 63 | | | | | | | | | |
| *Paraphoxus stenodes* | 74 | | | | | | | | | |
| *Paraphoxus lucubrans* | 4 | | | | | | | | | |
| *Paraphoxus fatigans* | 20 | | | | | | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **CRUSTACEANS** | | | | | | | | | | |
| *Paraphoxus heterocuspidatus* | 4 | | | | | | | | | |
| *Paraphoxus variatus* | 2 | | | | | | | | | |
| *Synchelidium* sp. (3 spp.) | 15 | | | | | | | | | |
| *Acuminodeutopus heteruropus* | 7 | | | | | | | | | |
| lysianassid | 2 | | 2 | | | | | | | |
| stenothoid | 1 | | | | | | | | | |
| *Ampelisca brevisimulata* | | | 4 | | | | | | | |
| *Ampelisca pacifica* | | | 3 | | | | | | | |
| *Ampelisca vera* | | | 5 | | | | | | | |
| *Haploops tubicola* | | | 1 | | | | | | | |
| *Harpinia fulgens* | | | 1 | | | | | | | |
| *Heterophoxus oculatus* | | | 3 | | | | | | | |
| *Maera* sp., blind | | | 30 | | | | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **CRUSTACEANS** | | | | | | | | | | |
| *Nicippe tumida* | | | 9 | | | | | | | |
| *Paraphoxus oculatus* | | | 4 | | | | | | | |
| *Phoxocephalus homilis* | | | 3 | | | | | | | |
| *Podocerus* cf. *cristatus* | | | 2 | | | | | | | |
| Cumaceans | | | | | | 2 | 1 | | | |
| *Diastylopsis tenuis* | 6 | | | | | | | | | |
| *Hemilamprops californica* | 1 | | | | | | | | | |
| *Cumella* sp. | 2 | | | | | | | | | |
| *Cumella*, another sp. | 2 | | | | | | | | | |
| *Eudorella* sp. | | | 9 | | | | | | | |
| diastylid | | | 1 | | | | | | | |
| *Leucon* sp. | | | 19 | | | | | | | |
| *Oxyurostylis pacifica* | | | 1 | | | | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **CRUSTACEANS** | | | | | | | | | | |
| *Diastylis* sp. | | | | 1 | | | | | | |
| *Leucon subnasica* | | | | | 5 | | 1 | | | |
| *Leucon*, nr. *subnasica* | | | | | | 1 | | | | |
| *Campylaspis canaliculata* | | | | | | 1 | | | | |
| Isopods | | | | | | | | | | |
| arcturid | 1 | | | | | | | | | |
| *Haliophasma geminata* | 5 | | 6 | | | | | | | |
| *Jaeropsis dubia* | 6 | | | | | | | | | |
| *Gnathia crenulatifrons* | | | 4 | | | | | | | |
| tanaids | 24 | | 4 | | | | | | | |
| ostracods | 57 | | 26 | | 11 | | | | | |
| caprellids, 2 spp. | 26 | | | | | | | | | |
| balanid | 1 | | | | | | | | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **CRUSTACEANS** | | | | | | | | | | |
| Decapods | | | | | | | | | | |
| pinnotherid | 2 | | 1 | 5 | | | | | | |
| *Heterocrypta* sp. | 1 | | | | | | | | | |
| *Cancer* sp. | 4 | | | | | | | | | |
| *Eupagurus* sp. | 1 | | | | | | | | | |
| ghost shrimp | | | | | | 1 | | | | |
| copepods of 2 kinds | 5 | | 2 | | | | | | | |
| pycnogonid | 1 | | | | | | | | | |
| **OTHERS** | | | | | | | | | | |
| anemone, ?*Harenactis*, sp. | 102 | | | | | | | | | |
| hydroids | 3 | | | | | | | | | |
| ceriantharian | | | | 4 | | | | | | |
| sea whip | | | | | | | | 3 | | |

## MUGU CANYON *(Continued)*

| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **OTHERS** | | | | | | | | | | |
| *Glottidia albida* | 41 | | | | | | | | | |
| phoronid | 2 jv | | 1 | | | | | | | |
| bryozoans | pres | | | | | | | | | |
| nemerteans | 25 | | 2 | 3 | 1 | 3 | | 7 | | |
| sipunculids | | | | | | 2 | | 2 | | |
| *?Phascolosoma agassizi* | | | 1 | | | | | | | |
| polyclads | | | 2 | 1 | | | | | | |
| echiuroids | | | | | | 4 | 1 | | | |
| oligochaetes | | | | | | 12 | | | | |
| enteropneusts | | | | | | 1 | | 4 | | |
| nematodes | 45 | | | | | | | | | |

## MUGU CANYON *(Continued)*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Station number | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
| Depth in meters | 119 | 124 | 177 | 367 | 378 | 548 | 676 | 755 | 832 | 850 |
| Kind of sediment | sand | sand, gravel | sand | sand, mud | mud, gravel | mud | silt | mud, silt | mud | mud |
| Gear used | OPG | CG | OPG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.88 | 1.07 | 2.58 | 1.07 | 2 gal. | 5.74 | 2.44 | 5.16 | 5.74 | 5.02 |
| Wt. of animals, gms. | 89.6 | negl. | 106.8 | 62.4 | 26.5 | 57.9 | 7.30 | 1.80 | 0.0 | 0.0 |
| **NUMBERS OF** | | | | | | | | | | |
| **POLYCHAETES** Species | 62 | 6 | 43 | 12 | 17 | 16 | 10 | 10 | 0 | 0 |
| Specimens | 421 | 15 | 402 | 52 | 74 | 125 | 53 | 25 | 0 | 0 |
| **ECHINODERMS** Species | 6 | 2 | 5 | 1 | 4 | 1- | 1 | 1 | 0 | 0 |
| Specimens | 22 | 2 | 35 | 1 | 49 | 1- | 1 | 1 | 0 | 0 |
| **MOLLUSKS** Species | 12 | 2 | 15 | 5 | 4 | 2 | 3 | 2 | 0 | 0 |
| Specimens | 39 | 2 | 214 | 9 | 4 | 5 | 6 | 5 | 0 | 0 |
| **CRUSTACEANS** Species | 43 | 0 | 24 | 3+ | 4+ | 4 | 2 | 1 | 0 | 0 |
| Specimens | 823 | 0 | 192 | 11 | 23 | 11 | 2+ | 2 | 0 | 0 |
| **OTHERS** Species | 7 | 0 | 5 | 3 | 1 | 5 | 1 | 4 | 0 | 0 |
| Specimens | 218+ | 0 | 6 | 8 | 1 | 22 | 1 | 16 | 0 | 0 |
| **TOTALS** Species | 130 | 10 | 92 | 24+ | 30+ | 28 | 17 | 18 | 0 | 0 |
| Specimens | 1523 | 19 | 849 | 82 | 151 | 164 | 63+ | 49 | 0 | 0 |

## MUGU CANYON *(Continued)*

| Station number . . . . . | 4852 | 6902 | 4851 | 6903 | 6909 | 6910 | 6911 | 6912 | 6913 | 7521 |
|---|---|---|---|---|---|---|---|---|---|---|
| Character of screenings | broken shell, worm tubes, dead snail shell | coarse gray sand with small worms, in gravel | silt with *Brisaster*, wormlike animals | gray sand, echiuroids and other wormlike animals | gravel, shell debris, sticks, dead animals | brissopsids, echiuroids, many worms | flocculent debris with worms | flocculent debris, small worms | tubes of *Phyllochaetopterus*, *Protis* | mud |
| Largest species | *Eupagurus*, in old snail shell | none | *Brisaster*, sipunculid, *Travisia pupa* | thalassemid | *Brisaster* | *Brisaster*, thalassemid | none | none | none | none |
| Most abundant or conspicuous species | *Diopatra ornata*, *Tharyx tesselata* | *Capitella capitata* subspp. | *Amphioplus*, *Acila*, *Maldane* | *Heteromastus* | *Chloeia*, *Amphiodia urtica*, *Pectinaria* | thalassemid, *Heteromastus* | *Decamastus*, *Chloeia* | *Spiophanes*, nemertean | none | none |

## DUME CANYON

| Station number | 6915 | 5505 | 5046 | 5674 | 6916 | 7520 | 5676 | 6917 | 6918 | 2965 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 299 | 374 | 398 | 507 | 530 | 580 | 652 | 711 | 741 | 905 |
| Kind of sediment | mud | sand | silt | mud | mud | mud | mud | mud | mud | mud |
| Gear used | CG | OPG | OPG | OPG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 4.38 | 3.18 | 3.15 | 2.36 | 5.31 | 3.15 | 3.30 | 5.88 | 4.8 | 3.3 |
| Wt. of animals, gms. | 153.7 | 53.64 | 50.6 | 47.1 | 90.8 | 56.39 | 8.10 | 18.4 | 3.0 | 0.0 |
| **POLYCHAETES** | | | | | | | | | | |
| *Aglaophamus* sp. | 1 jv | | | | | | | | | |
| *Amphicteis scaphobranchiata* | 1 | | | | | | | | | |
| *Glycera capitata* | 1 | | | | | | | | | |
| *Goniada brunnea* | 2 | 1 | 3 | | | | | | | |
| *Haploscoloplos elongatus* | 1 | | | | | | | | | |
| *Lepidasthenia* sp. | 1 | | | | | | | | | |
| *Harmothoë* sp. | 1 | | | | | | | | | |
| *Lumbrineris index* | 1 | | | | 10 lg | | | | | |
| *Ninoë gemmea* | 1 | | | | | | | | | |
| *Nothria pallida* | 3 | 14 | | | 1 | | | | | |
| *Pectinaria californiensis* | 1 | 21 | 10 | | | | | | | |
| *Pista disjuncta* | 2 | 5 | 9 | | | | | | | |
| *Phyllochaetopterus limicolus* | 1 | | | | | | | | | |

## DUME CANYON *(Continued)*

| Station number | 6915 | 5505 | 5046 | 5674 | 6916 | 7520 | 5676 | 6917 | 6918 | 2965 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 299 | 374 | 398 | 507 | 530 | 580 | 652 | 711 | 741 | 905 |
| Kind of sediment | mud | sand | silt | mud | mud | mud | mud | mud | mud | mud |
| Gear used | CG | OPG | OPG | OPG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 4.38 | 3.18 | 3.15 | 2.36 | 5.31 | 3.15 | 3.30 | 5.88 | 4.8 | 3.3 |
| Wt. of animals, gms. | 153.7 | 53.64 | 50.6 | 47.1 | 90.8 | 56.39 | 8.10 | 18.4 | 3.0 | 0.0 |
| **POLYCHAETES** | | | | | | | | | | |
| *Prionospio pinnata* | 3 | 3 | 4 | | | 5 sm | | | | |
| *Axiothella* sp. | | 1 | | | | | | | | |
| *Chloeia pinnata* | | 11 | | | | | | | | |
| *Harmothoë*, nr *lunulata* | | 2 | 1 | | | | | | | |
| *Maldane sarsi* | | 3 jv | ?3 | | ?2 | | | | | |
| *Nephtys* sp. | | 9 jv | 1 | | | | | | | |
| *Nereis procera* | | 1 | | | | | | | | |
| *Oxydromus a. glabrus* | | 1 | | | | | | | | |
| *Onuphis parva* | | 3 | 7 | | | | | | | |
| *Spiophanes* sp. | | 2 jv | | 3 jv | | | | | | |
| *Tharyx tesselata* | | 3 | | | | | | | | |
| *Eumida ?tubiformis* | | | | 1 | | | | | | |
| *Glycera americana* | | | | 2 | | | | | | |

## DUME CANYON *(Continued)*

| Station number | 6915 | 5505 | 5046 | 5674 | 6916 | 7520 | 5676 | 6917 | 6918 | 2965 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 299 | 374 | 398 | 507 | 530 | 580 | 652 | 711 | 741 | 905 |
| Kind of sediment | mud | sand | silt | mud | mud | mud | mud | mud | mud | mud |
| Gear used | CG | OPG | OPG | OPG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 4.38 | 3.18 | 3.15 | 2.36 | 5.31 | 3.15 | 3.30 | 5.88 | 4.8 | 3.3 |
| Wt. of animals, gms. | 153.7 | 53.64 | 50.6 | 47.1 | 90.8 | 56.39 | 8.10 | 18.4 | 3 0 | 0.0 |
| **POLYCHAETES** | | | | | | | | | | |
| *Eunice americana* | | | | 1 | | | | | | |
| *Melinna heterodonta* | | | | 1 lg | | | | | | |
| *Nothria iridescens* | | | | 14 | | | | | | |
| *Onuphis vexillaria* | | | | 12 | 2 | 1 | | | | |
| *Praxillella a. pacifica* | | | | 3 | | | | | | |
| *Ancistrosyllis breviceps* | | | | | | 2 | | | | |
| *Ancistrosyllis tentaculata* | | | | | 1 | 1 | | | | 2 |
| *Brada pilosa* | | | | | 2 | 1 | | 1 | | |
| *Califia calida* | | | | 4 lg | | 3 | 7 | 4 | | |
| *Goniada* sp. | | | | 1 | | 1 jv | | | | |
| *Heteromastus filobranchus* | | | | 6 | | | | | | |
| *Lumbrineris*, moniliform | | | | 1 | | | | | | |
| *Prionospio* sp. | | | | 1 | | | | | | |

## DUME CANYON *(Continued)*

| Station number | 6915 | 5505 | 5046 | 5674 | 6916 | 7520 | 5676 | 6917 | 6918 | 2965 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 299 | 374 | 398 | 507 | 530 | 580 | 652 | 711 | 741 | 905 |
| Kind of sediment | mud | sand | silt | mud | mud | mud | mud | mud | mud | mud |
| Gear used | CG | OPG | OPG | OPG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 4.38 | 3.18 | 3.15 | 2.36 | 5.31 | 3.15 | 3.30 | 5.88 | 4.8 | 3.3 |
| Wt. of animals, gms. | 153.7 | 53.64 | 50.6 | 47.1 | 90.8 | 56.39 | 8.10 | 18.4 | 3.0 | 0.0 |
| **POLYCHAETES** | | | | | | | | | | |
| sigalionid, fragment | | | | 1 | | | | | | |
| *Leiochrides hemipodus* | | | | | 1 | 1 | 1 | | | |
| *Prionospio ?cirrifera* | | | | | 1 | | | | | |
| nephtyid | | | | | 1 jv | | | | | |
| *Phylo* sp. | | | | | 1 lg | | | | | |
| *Spiophanes* sp. | | | | | | 2 | | | | |
| *Aricidea lopezi* | | | | | | | 3 | | | |
| *Asychis*, unknown sp. | | | | | | | 2 | | | |
| *Cirratulus* sp. | | | | | | | 2 | 2 | | |
| *Myriochele gracilis* | | | | | | | 1 | | | |
| *Cossura candida* | | | | | | | | 2 | | |
| *Antinoella* sp. | | | | | | | | 1 frg | | |
| *Melinnexis* sp. | | | | | | | | 1 | | |

## DUME CANYON *(Continued)*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Station number | 6915 | 5505 | 5046 | 5674 | 6916 | 7520 | 5676 | 6917 | 6918 | 2965 |
| Depth in meters | 299 | 374 | 398 | 507 | 530 | 580 | 652 | 711 | 741 | 905 |
| Kind of sediment | mud | sand | silt | mud | mud | mud | mud | mud | mud | mud |
| Gear used | CG | OPG | OPG | OPG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 4.38 | 3.18 | 3.15 | 2.36 | 5.31 | 3.15 | 3.30 | 5.88 | 4.8 | 3.3 |
| Wt. of animals, gms. | 153.7 | 53.64 | 50.6 | 47.1 | 90.8 | 56.39 | 8.10 | 18.4 | 3.0 | 0.0 |
| **POLYCHAETES** | | | | | | | | | | |
| *Sternaspis* sp. | | | | | | | | | 2 | |
| **ECHINODERMS** | | | | | | | | | | |
| *Ophiomusium jolliensis* | 1 jv | | | | | | | | | |
| *Brisaster townsendi* | 3 lg | 2 | | 1 | 2 | 3 | | | | |
| *Amphioplus strongyloplax* | | 1 | 2 | | | | | | | |
| *Amphiodia urtica* | | 1 | 4 | | | | | | | |
| *Pisaster capitatus* | | 1 | | | | | | | | |
| *Brissopsis pacifica* | | | 1 lg | 3 | 3 | 3 | 1 | | | |
| **MOLLUSKS** | 1+ | | | | | | | | | |
| *Axinopsida* sp. | 1 | | | | | | | | | |
| *Cadulus* sp. | 1 | | | | | | | | | |
| solenogasters | 1 | | | 1 | 9 | | | | | |
| *Crystallophrisson* spp. | | 1 | 1 | | | 6 | 2 | 3 | | |

## DUME CANYON *(Continued)*

| Station number | 6915 | 5505 | 5046 | 5674 | 6916 | 7520 | 5676 | 6917 | 6918 | 2965 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 299 | 374 | 398 | 507 | 530 | 580 | 652 | 711 | 741 | 905 |
| Kind of sediment | mud | sand | silt | mud | mud | mud | mud | mud | mud | mud |
| Gear used | CG | OPG | OPG | OPG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 4.38 | 3.18 | 3.15 | 2.36 | 5.31 | 3.15 | 3.30 | 5.88 | 4.8 | 3.3 |
| Wt. of animals, gms. | 153.7 | 53.64 | 50.6 | 47.1 | 90.8 | 56.39 | 8.10 | 18.4 | 3.0 | 0 0 |
| **MOLLUSKS** | | | | | | | | | | |
| *Prochaetoderma* sp. | | 5 | | | | 6 | | | | |
| ?*Bittium* sp. | | 14 | | | | | | | | |
| snail, small white | | 1 | | | | | | | | |
| clams, small white | | 8 | | | | pres | 2 | | 1 | |
| *Mitrella permodesta* | | | | | | 8 | | | | |
| *Compsomyax*, sp., small | | | | | | 173 | | | | |
| *Solemya* sp. | | | | | | 4 | | | | |
| white clam, rugose | | | | | | | | | 1 | |
| **CRUSTACEANS** | | | | | | | | | | |
| amphipods | 2+ | 3 | 1 | | | 5 | 1 | | | |
| aorid | | 1 | | | | | | | | |
| *Heterophoxus oculatus* | | 1 | 2 | | | | | | | |
| *Harpinia* sp. | | 2 | | | | | | | | |

## DUME CANYON *(Continued)*

| Station number | 6915 | 5505 | 5046 | 5674 | 6916 | 7520 | 5676 | 6917 | 6918 | 2965 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 299 | 374 | 398 | 507 | 530 | 580 | 652 | 711 | 741 | 905 |
| Kind of sediment | mud | sand | silt | mud | mud | mud | mud | mud | mud | mud |
| Gear used | CG | OPG | OPG | OPG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 4.38 | 3.18 | 3.15 | 2.36 | 5.31 | 3.15 | 3.30 | 5.88 | 4.8 | 3.3 |
| Wt. of animals, gms. | 153.7 | 53.64 | 50.6 | 47.1 | 90.8 | 56.39 | 8.10 | 18.4 | 3.0 | 0.0 |
| **CRUSTACEANS** | | | | | | | | | | |
| *Idunella* sp. | | 1 | 1 | | | | | | | |
| *Phoxocephalus* sp. | | 4 | 1 | | | | | | | |
| *Ampelisca* sp. | | | 1 | | | | | | | |
| *Paraphoxus epistomus* | | | | 1 | | | | | | |
| cumaceans | 2 | | | | | | | | | |
| *Campylaspis* sp. | | 1 | | | | | | | | |
| ostracods, 2 kinds | | 3 | | | | | | | | |
| ostracod, rectangular | | | 1 | | | | | | | |
| pinnixid crab | | | 1 | | | | | | | |
| ghost shrimp, ?*Callianassa* | | | | 1 | | 1 | | | 1 lg | |
| crab, small | | | | | | | | 1 | | |
| **OTHERS** | | | | | | | | | | |
| nemerteans | | 1 | 1 | 2 | 1 | 7 | 1 | 1 | 1 | |

## DUME CANYON *(Continued)*

| Station number | 6915 | 5505 | 5046 | 5674 | 6916 | 7520 | 5676 | 6917 | 6918 | 2965 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 299 | 374 | 398 | 507 | 530 | 580 | 652 | 711 | 741 | 905 |
| Kind of sediment | mud | sand | silt | mud | mud | mud | mud | mud | mud | mud |
| Gear used | CG | OPG | OPG | OPG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 4.38 | 3.18 | 3.15 | 2.36 | 5.31 | 3.15 | 3.30 | 5.88 | 4.8 | 3.3 |
| Wt. of animals, gms. | 153.7 | 53.64 | 50.6 | 47.1 | 90.8 | 56.39 | 8.10 | 18.4 | 3.0 | 0.0 |
| **OTHERS** | | | | | | | | | | |
| echiuroid, *Arhynchite* | | | | | | | | 2 | | |
| sipunculids | | | | | 3 | | | 1 | | |
| enteropneusts | | | | 1 | | | 1 | 3 | | |

## DUME CANYON *(Continued)*

| Station number | 6915 | 5505 | 5046 | 5674 | 6916 | 7520 | 5676 | 6917 | 6918 | 2965 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 299 | 374 | 398 | 507 | 530 | 580 | 652 | 711 | 741 | 905 |
| Kind of sediment | mud | sand | silt | mud | mud | mud | mud | mud | mud | mud |
| Gear used | CG | OPG | OPG | OPG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 4.38 | 3.18 | 3.15 | 2.36 | 5.31 | 3.15 | 3.30 | 5.88 | 4.8 | 3.3 |
| Wt. of animals, gms. | 153.7 | 53 64 | 50.6 | 47.1 | 90.8 | 56.39 | 8 10 | 18.4 | 3.0 | 0.0 |
| **NUMBERS OF** | | | | | | | | | | |
| **POLYCHAETES** Species | 14 | 15 | 8 | 14 | 10 | 10 | 6 | 6 | 2 | 0 |
| Specimens | 20 | 80 | 38 | 51 | 22 | 19 | 16 | 11 | 4 | 0 |
| **ECHINODERMS** Species | 2 | 4 | 3 | 2 | 2 | 2 | 1 | 0 | 0 | 0 |
| Specimens | 4 | 5 | 7 | 4 | 5 | 6 | 1 | 0 | 0 | 0 |
| **CRUSTACEANS** Species | 2+ | 9 | 7 | 2 | 0 | 3 | 1 | 1 | 1 | 0 |
| Specimens | 4+ | 16 | 8 | 2 | 0 | 7 | 1 | 1 | 1 | 0 |
| **MOLLUSKS** Species | 4+ | 7 | 1 | 1 | 1 | 6 | 2 | 1 | 2 | 0 |
| Specimens | 4+ | 29 | 1 | 1 | 9 | 197 | 4 | 3 | 2 | 0 |
| **OTHERS** Species | 0 | 1 | 1 | 2 | 2 | 1 | 2 | 4 | 1 | 0 |
| Specimens | 0 | 1 | 1 | 3 | 4 | 7 | 2 | 7 | 1 | 0 |
| **TOTALS** Species | 22+ | 36 | 20 | 21 | 15 | 22 | 12 | 12 | 6 | 0 |
| Specimens | 32+ | 131 | 55 | 61 | 40 | 236 | 24 | 22 | 8 | 0 |

## DUME CANYON *(Continued)*

| Station number . . . . | 6915 | 5505 | 5046 | 5674 | 6916 | 7520 | 5676 | 6917 | 6918 | 2965 |
|---|---|---|---|---|---|---|---|---|---|---|
| Characteristics of the screenings | brissopsid and wormlike animals | silty debris, brissopsids, wormlike animals | silt with brissopsid and worms | silt with brissopsids and worms | silt, dead *Amphissa* shells, brissopsids, worms | broken shell of ?*Compsomyax*, brissopsids, other animals, tesselated balls | silt with echinoids and worms | black plant debris, worms | dead tubes of *Phyllochaetopterus* | dead tubes |
| Largest species | *Brisaster townsendi*, *Pista disjuncta* | *Brisaster townsendi* | *Brissopsis* | brissopsids | brissopsids | brissopsids | *Brissopsis*, nemertean | ampharetid, thalassemid | ghost shrimp | none |
| Most conspicuous or abundant species | *Nothria pallida*, *Pista disjuncta* | *Pectinaria californiensis*, *Bittium* | *Nothria*, *Onuphis*, *Pectinaria* | *Brissopsis*, *Heteromastus* | *Lumbrineris index* | *Solemya*, ghost shrimp | *Califia calida* | *Melinnexis*, *Califia* | none | none |

## SANTA MONICA CANYON

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | ...... | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Ancistrosyllis tentaculata* | 2 | 1 | | | | | 1 | | | 1 | 2 | | | | |
| *Capitella capitata* subspp. | 4500+ | 55 | | | | | | | | | | | | | |
| *Dorvillea articulata* | 112 | 38 | | | | | | | | | | | | | |
| *Dorvillea gracilis* | 1+ | | | | | | | | | | | | | | |
| *Eumida*, dark-barred | 3 | | | | | | | | | | | | | | |
| *Eunice americana* | 1 | | 4 | 3 | 1 | | | | | | | | | | |
| *Exogone uniformis* | 1 | 2 | 1 | | | | | | | | | | | | |
| *Glycera americana* | 4 | | | | | | | | | | | | | | |
| *Goniada brunnea* | 2 | | | 1 | | | | | | | | | | | |
| *Lumbrineris* sp. | 3 | | | 2 | | | | | 1 | | | | | | |
| *Nereis procera* | 8 | | 1 | 1 | | | | | | | | | | | |
| *Ninoë gemmea* | 4 | 2 | | | | | | | | | | | | | |
| *Notomastus tenuis* | ?14 | 6 | 2 | 1 | 2 | | | | | | | | | | |

## SANTA MONICA CANYON *(Continued)*

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Ophiodromus pugettensis* | 12 | | | | | | | | | | | | | | |
| *Paranaitis polynoides* | 1 | | | | | | | | | | | | | | |
| *Pectinaria californiensis* | 1 | | 4 | 2 | 1 | | 2 | | | | | | | | |
| *Peisidice aspera* | 2 | | | | | | | | | | | | | | |
| *Prionospio malmgreni* | 1 | | 1 | 2 | | | | | | | | | | | |
| *Telepsavus costarum* | 1 | | | | | | | | | | | | | | |
| *Tharyx* sp. | 1 | | | | | | | | | 1+ | | | | | |
| unidentified small spp. | 20 | | | | | | | | | | | | | | |
| *Chloeia pinnata* | | 1 | 1 | 2 | 14 | | | | | | | | | | |
| *Nereis pelagica neonigripes* | | 5 | | | | | | | | | | | | | |
| *Oxydromus a. glabrus* | | 2 | 2 | 1 | | | | 1 | | 1 | | | | | |
| *Pholoë glabra* | | 2 | | | | | | | | | | | | | |
| *Amage ?anops* | | | 1 | 1 | | | | | | | | | | | |

## SANTA MONICA CANYON *(Continued)*

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | . .. | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Ampharete arctica* | | | ?1 | 4 | | | | | | | | | | | |
| *Amphicteis scaphobranchiata* | | | 1 | 1 | | | | 1 lg | | | | | | | |
| *Anaitides ?madeirensis* | | | 1 | | 1 | | | | | | | | | | |
| *Ancistrosyllis breviceps* | | | 1 | | | | | | 2 | 1- | 2 | 1- | 1 | | |
| *Aricidea lopezi* | | | 1 | 1 | | | | | | | | | | | |
| *Drilonereis* sp. | | | 3 | 2 | | | 1 | | | | | | | | |
| *Glycera* cf. *capitata* | | | 3 | 1 | | | | | | | | | | | |
| *Glycinde ?armigera* | | | 2 | | | | | | | | | | | | |
| *Harmothoë* sp. | | | 3 | | | 1 | | | | | | | | | |
| *Hesperonoë laevis* | | | 3 | | | | | | | | | | | | |
| *Lumbrineris cruzensis* | | | 3 sm | | 2 | | | 2 sm | | | | | | | |
| *Maldane sarsi* | | | 6 | 39 | 43 | 64 | | 17 | 36 sm | | 1 | | | | |
| *Marphysa disjuncta* | | | 1 | | | | | | | | | | | | |

## SANTA MONICA CANYON *(Continued)*

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | .... | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Melinna heterodonta* or sp. | | | 10 | 3 | | | 1 | | | | | | | | |
| *Nephtys* spp. | | | 2 jv | 8 jv | | | | | 1 jv | | | | | | |
| *Nothria iridescens* | | | 15 | 36 | 24 | 3 | | | | | | | | | |
| *Onuphis parva* | | | 1 | 6 | 3 | | | | | | | | | | |
| *Owenia* sp. | | | 1 | | | | | | | | | | | | |
| *Paraonis gracilis* | | | 3 | 2 | | | 3 | 5 | | 1 | 2 | | 2 | | |
| *Pista disjuncta* | | | 1 | | | | | | | 1 | | | | | |
| *Poecilochaetus johnsoni* | | | 1 | | | | | | | | | | | | |
| *Praxillella gracilis* | | | 1 | 1 | | | | | | | | | | | |
| *Prionospio cirrifera* | | | 1 | | | | | | | | | ?3 | | | |
| *Prionospio pinnata* | | | 3 | 1 | 3 | | 1 | | | 1 | | | | | |
| *Prionospio* spp. | | | | | | | | | 1 | 1+ | | | | | |
| *Rhodine bitorquata* | | | 6 | | | | | | | | | | | | |

## SANTA MONICA CANYON *(Continued)*

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | ........ | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Spio punctata* | | | 3 | | | | | | | | | | | | |
| *Spiophanes fimbriata* | | | 16 | | 1 | | | | | | | | 8 | | |
| *Streblosoma crassibranchia* | | | 1 | | | | | | 1 | 1 | | | | | |
| *Terebellides stroemi* | | | 3 | 1 | | | | | | 1 | | | | | |
| *Tharyx monilaris* | | | 2 | | | | | | | | | | | | |
| *Tharyx tesselata* | | | 4 | 3 | | | | | | 1 | | | | | |
| *Aricidea*, nr *suecica* | | | | 7 | | | | | | | | | | | |
| *Asychis disparidentata* | | | | 1 lg | | | | | | | | | | | |
| *Cossura candida* | | | | 1 | | | | | | | 1 | | 3 | | |
| *Anaitides* sp., small form | | | | 1 | | | | | | | | | | | |
| *Eteone californica* | | | | 1 | | | | | | | | | | | |
| *Exogonella brunnea* | | | | 3 | | | | | | | | | | | |
| *Lepidasthenia* sp. | | | | 2 | | | | | | | | | | | |

## SANTA MONICA CANYON *(Continued)*

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | ...... | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Lepidonotus caelorus* | | | | 1 | | | | | | | | | | | |
| *Lumbrineris bicirrata* | | | | 1 lg | | | | | | | | | | | |
| *Lumbrineris limicola* | | | | 1 | | | | | | | | | | | |
| maldanids | | | | 2 lg | | | | | | | | | | | |
| *Myriochele gracilis* | | | | 2 | | | | | | 1 | ?4 | | | | |
| *Spiophanes missionensis* | | | | 2 jv | | | | | | | | | | | |
| *Harmothoë* nr *lunulata* | | | | | 1 | | | | | | | | | | |
| *Pherusa* cf. *papillata* | | | | | 1 | | | | | | | | | | |
| *Pilargis maculata* | | | | | 1 | | | | | | | | | | |
| *Polycirrus* sp. | | | | | 3 | | | | | | | | | | |
| *Praxillella a. pacifica* or sp. | | | | | 1 | | 2 | | 1- | | | | ?1 | | |
| *Aricidea* spp. | | | | | | 1 | | | | 1 | | | | 1 | |
| *Lumbrineris californiensis* | | | | | | 1 | | | | | | | | | |

## SANTA MONICA CANYON *(Continued)*

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | ...... | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Onuphis vexillaria* | | | | | | 8 | 5 lg | 3 lg | | | 1 lg | | | | |
| *Pilargis hamatus* | | | | | | ?1 | | | | | | | | | |
| *Brada pilosa* | | | | | | | 1 | 1 | | | | | | | |
| *Glycinde ?wireni* | | | | | | | 1 | | | | | | | | |
| *Goniada annulata* | | | | | | | 1 lg | | | 1 | | | | | |
| *Lumbrineris index* | | | | | | | 1 lg | | | | | | | | |
| *Pilargis* sp. | | | | | | | 1 | | | | 1 | | | | |
| *Sthenelais tertiaglabra* | | | | | | | 1 | | | | | | | | |
| *Aricidea uschakowi* | | | | | | | | 2 | | | | 4 | | | |
| *?Axiothella* sp. | | | | | | | | 1 | | | | | | | |
| *Chone* sp. | | | | | | | | 1 | | | | | | | |
| *Spiophanes anoculata* | | | | | | | | 1 | | | | | | | |
| *Heteromastus filobranchus* | | | | | | | | | 1- | ?1 | | | | | |

## SANTA MONICA CANYON *(Continued)*

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | ...... | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Aglaophamus erectans* | | | | | | | | | | 1 jv | | | | | |
| *Amphicteis mucronata* | | | | | | | | | | | 1 | | | | |
| *Aphrodita* sp. | | | | | | | | | | 1 | | | | | |
| *Aricidea ramosa* | | | | | | | | | | | 2 | 1 | | | |
| *Chaetozone gracilis* | | | | | | | | | | 1 | | | | | |
| *Cirratulus* sp., anoculate | | | | | | | | | | 2 | 2 | | 1 | | |
| ampharetid | | | | | | | | | | 3 jv | | | 4 | | |
| *Glycera c. branchiopoda* | | | | | | | | | | | 1 | | 4 | | |
| ?*Melinnexis* sp. | | | | | | | | | | | 1 lg | | | | |
| ?*Potamethus mucronatus* | | | | | | | | | | | 2 | | | | |
| terebellid fragments | | | | | | | | | | | 3 | | | | |
| *Protis pacifica* | | | | | | | | | | | tubes | | 5 | 20 | |
| *Terebellides* sp. | | | | | | | | | | | | 1 | 3 | | |

## SANTA MONICA CANYON *(Continued)*

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | ........ | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Autolytus* sp. | | | | | | | | | | | | 1 | | | |
| *Amphisamytha* sp. | | | | | | | | | | | | 1 | | | |
| *Califia* cf. *calida* | | | | | | | | | | 1 | | 1 | 3 lg | | 1 |
| *Glycera*, nr *tenuis* | | | | | | | | | | | | 2 | | | |
| *Phyllochaetopterus limicolus* | | | | | | | | | | | | | 2 lg | | |
| *Aricidea lopezi rubra* | | | | | | | | | | | | | 8 | | |
| *Ceratocephala c. americana* | | | | | | | | | | | | | 1 | | |
| *Chaetozone*, nr *spinosa* | | | | | | | | | | | | | 7 | | |
| *Asclerocheilus*, unknown sp. | | | | | | | | | | | | | 1 lg | | |
| nereid | | | | | | | | | | | | | 1 | | |
| *Notomastus hemipodus* | | | | | | | | | | | | | 1 | | |
| *Oxydromus* sp. | | | | | | | | | | | | | 5 | | |
| *Polydora* sp. | | | | | | | | | | | | | 1 | | |
| harmothoid | | | | | | | | | | | | | 1 | | |

## SANTA MONICA CANYON *(Continued)*

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | . | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **ECHINODERMS** | | | | | | | | | | | | | | | |
| *Amphipholis squamata* | | | | 6 | | | 1 jv | 2 | | | | | 1 | | |
| *Amphiodia urtica* | | | | 1 | | | | 3 | | 1 | | | | | |
| *Leptosynapta albicans* | | | | | 1 | | | | | | | 1 | | | |
| *Brisaster townsendi* | | | | | | 2 | | | 2 | | | | 1 | | |
| *Brissopsis pacifica* | | | | | | 2 | | 2 lg | 1 | | 2 | | | | |
| *Amphiura arcystata* | | | | | | | 1 jv | | | | | | | | |
| *Amphioplus strongyloplax* | | | | | | | | | 1 | | | | | | |
| *Ophiocynodus corynetes* | | | | | | | | | | | 1 | | 1 | | |
| ophiuroids | | | | | | | | | | | | 1 | | 1 | |
| *Ophiomusium jolliensis* | | | | | | | | | | | | | 2 | | |
| *Ophiacantha* sp.? | | | | | | | | | | | | | 1 | | |
| **MOLLUSKS** | | | | | | | | | | | | | | | |
| *Amphissa* sp. | 1+ | | | | | 1 | | 4 | 18 | | | | | | |

## SANTA MONICA CANYON *(Continued)*

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | ...... | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **MOLLUSKS** | | | | | | | | | | | | | | | |
| *Acteon* sp. | 1+ | | | | | | | | | | | | | | |
| *Solemya* sp. | 21 | 8 | | | | | | | | | | | | | |
| *Tellina carpenteri* | 5 | 34 | | | | | | | | | | | | | |
| *Lucinoma annulata* | | 6 sm | | | | | | | | | | 1 | 1 | | |
| *Thyasira* sp. | | 1 | | | | | | | | | | | | | |
| *Crystallophrisson* spp. | | | 1 | 1 | 1 | | 1 | | 3 | 2 | 5 | | 4 | | |
| *Saxicavella* sp. | | | 2 | | | 3 | | | | | | | | | |
| slug, incised | | | | 1 | | | | | | | | | | | |
| small white clams | | 12 | | | 1 | | | | | | | | ca 60 | | |
| *Cardita ventricosa* | | | | | | 1 | | | 26 | | | | | | |
| *Cadulus tolmiei* or sp. | | | | | | 1 | | | 4 | | | | | | |
| *Prochaetoderma* sp. | | | | | | 1 | | | | | 2 | | | | |
| ?*Bittium* sp. | | | | | | | | | 15 | | | | | | |

## SANTA MONICA CANYON *(Continued)*

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | ........ | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **MOLLUSKS** | | | | | | | | | | | | | | | |
| *Semele dehiscens* | | | | | | | | | | 2 lg | | | | | |
| *Mitrella permodesta* | | | | | | | | | | 1 | | 1 | | | |
| **CRUSTACEANS** | | | | | | | | | | | | | | | |
| amphipods | 4+ | 1 | 1 | 4 | 5 | | | | | | | | 1 | | |
| cancroid | 1 | | | | | | | | | | | | | | |
| gnathid isopod | | | 2 | 1 | | | | | | | | | | | |
| anthurid isopod | | | 2 | | 1 | | | | | | | | | | |
| parasitic copepod | | | 1 | | | | | 2 | | | | | | | |
| ostracods | | | | 5 | 1 | | | | | | | | | | |
| cumaceans | | | | 1 | | | | | | | | | | | |
| *Procampylaspis* sp. | 1 | | | | | | | | | | | | | | |
| *Eudorella* sp. | | | | 1 | | | | | | | | | | | |
| caprellid | | | | 1 | | | | | | | | | | | |

## SANTA MONICA CANYON *(Continued)*

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | ........ | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **CRUSTACEANS** | | | | | | | | | | | | | | | |
| tanaid | | | | 5 | | 1 | | 1 | | | | | | | |
| ghost shrimp, or *Callianassa* sp. | | | | | | | | | | | 1 lg | | 1 | | |
| *nebaliacean* | | | | | | | | | | | | 1 | | | |
| *stalk-eyed-shrimp* | | | | | | | | | | | | | 1 | | |
| **OTHERS** | | | | | | | | | | | | | | | |
| nemerteans | | | | | | | | | 1 | 1 | 3 | 1 | 5 | 1 | |
| bryozoans | | | | | | | | | | pres. | | | | | |
| *Arhynchite* sp. | | | 3 lg | 2 | | 1 lg | | 1 sm | | | | | | | |
| ?*Siphonosoma ingens* | | | 4 | | | | | | | | | | | | |
| other sipunculids | | | | 1 | | | | | | 2 sm | | | | | |
| polyclad | | | | | | | 1 | | | | | | | | |
| *Glottidia albida* | | | | | | | | 2 jv | | | 1 | | | | |
| echiuroid, other kind | | | | | | | | | | 2 | 3 | | | | |

## SANTA MONICA CANYON *(Continued)*

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | ........ | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **OTHERS** | | | | | | | | | | | | | | | |
| gorgonian | | | | pres. | | | | | | | | | | | |
| ceriantharian | | | | 1 | 1 | | 2 | | | | | | | | |
| anemone | | | | | | | | | 1 | | | | 1 sm | | |

## SANTA MONICA CANYON *(Continued)*

| Station number | 6781 | 6780 | 3000 | 3180 | 3179 | 3178 | 2999 | 3399 | 6779 | 3177 | 6778 | 3176 | 7517 | 6777 | 6776 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 116 | 183 | 268 | 330 | 362 | 431 | 454 | 463 | 475 | 542 | 583 | 612 | 695 | 810 | 873 |
| Kind of sediment | sand, silt | mud, sand | clay, shell | mud, silt | mud | mud | mud | mud | silt, clay, sand | mud | clay | mud, sand | mud | mud | mud |
| Gear used | CG | CG | OPG | OPG | OPG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.57 | 2.58 | 2.2 | 1.7 | 2.01 | 2.33 | 2.83 | 2.58 | 4.59 | 2.14 | 4.8 | 1.95 | 4.16 | 5.09 | 5.74 |
| Wt. of animals, gms. | 9.2 | 4.4 | 41.3 | 20.43 | 8.3 | 2.14 | 27.7 | 2.6 | 21.6 | ........ | 29.4 | ........ | 8.85 | negl. | 0.0 |
| **NUMBERS OF POLYCHAETES** Species | 21+ | 10 | 40 | 38 | 16 | 7 | 13 | 11 | 8 | 21 | 14 | 9 | 20 | 4 | 1 |
| Specimens | 9388 | 114 | 120 | 150 | 102 | 79 | 21 | 35 | 43 | 24 | 24 | 15 | 64 | 23 | 1 |
| **ECHINODERMS** Species | 0 | 0 | 0 | 2 | 1 | 2 | 2 | 3 | 3 | 0 | 2 | 2 | 5 | 1 | 0 |
| Specimens | 0 | 0 | 0 | 7 | 1 | 4 | 2 | 7 | 5 | 0 | 3 | 2 | 6 | 1 | 0 |
| **MOLLUSKS** Species | 4+ | 6+ | 2 | 2 | 2 | 5 | 6 | 1 | 5 | 3 | 2 | 2 | 7 | 0 | 0 |
| Specimens | 28+ | 61 | 3 | 2 | 2 | 7 | 10+ | 4 | 66 | 5 | 7 | 2 | 67 | 0 | 0 |
| **CRUSTACEANS** Species | 2 | 1 | 4 | 6 | 5 | 1 | + | 2 | 1+ | 0 | 1 | 2 | 3 | 0 | 0 |
| Specimens | 7+ | 1 | 6 | 17 | 7 | 1 | + | 3 | 15 | 0 | 1 | 8 | 3 | 0 | 0 |
| **OTHERS** Species | 1 | 1 | 3 | 6 | 3 | 1 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 0 | 0 |
| Specimens | 1 | 1 | 10 | 7 | 3 | 1 | 2 | 2 | 2 | 6 | 9 | 2 | 6 | 0 | 0 |
| **TOTALS** Species | 28+ | 18+ | 49 | 54 | 27 | 16 | 23+ | 19 | 19+ | 27 | 22 | 17 | 37 | 5 | 1 |
| Specimens | 9424 | 177 | 139 | 183 | 115 | 92 | 35+ | 51 | 131 | 35 | 44 | 29 | 146 | 24 | 1 |

## SANTA MONICA CANYON *(Continued)*

| Station number | Characteristics of the screenings | Largest species | Most abundant or conspicuous species |
|---|---|---|---|
| 6781 | flocculent debris with small animals | cancroid crab | *Capitella*, *Dorvillea* |
| 6780 | flocculent debris, dead *Acila* and *Bittium* shells | *Solemya* | *Capitella*, *Dorvillea*, *Tellina*, *Solemya* |
| 3000 | dead scaphopods, shelly sand, worms | *Arhynchite*, ?*Siphonosoma* | *Nothria*, spionids |
| 3180 | shaley rubble, wormlike animals | *Arhynchite*, *Asychis* | *Maldane sarsi*, *Nothria* |
| 3179 | wormlike animals | none | *Maldane sarsi*, *Nothria* |
| 3178 | echinoids, wormlike animals | ?*Arhynchite*, *Onuphis vexillaria* | *Maldane sarsi* |
| 2999 | brown waxy lumps, wormlike animals | *Onuphis vexillaria* | none |
| 3399 | dead *Amphissa* shells, wormlike animals | *Brissopsis*, *Onuphis vexillaria*, nemertean | *Maldane sarsi* |
| 6779 | coarse debris, animals | brissopsids | *Maldane sarsi*, *Cardita*, *Amphissa* |
| 3177 | wormlike animals | echiuroid, *Pista disjuncta*, nemertean | none |
| 6778 | dead shells of *Solemya*, *Cadulus*, animals | brissopsids | echinoderms |
| 3176 | siliceous sponge, hard shale with large burrows, living animals | *Lucinoma annulata* | none |
| 7517 | dark sand, many animals | *Solemya*, *Callianassa* | small clams |
| 6777 | debris, bottom nearly dead | none | none |
| 6776 | muddy debris, bottom dead | none | none |

## REDONDO CANYON, SOUTH WALL

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand, gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | → |
| **POLYCHAETES** | | | | | | | |
| *Amaeana occidentalis* | 2 | | | | | | |
| *Ammotrypane aulogaster* | 1 | | | | | | |
| ampharetids | 1+ | | 3 | | | | |
| *Armandia bioculata* | 1 | | | | | | |
| *Brada* sp. | 4 | | | | | | |
| capitellid | 1+ | | | | | | |
| *Ceratocephala crosslandi americana* | 2 | 1 | | | | | |
| *Chloeia pinnata* | 150+ | 1 | 28 | 20 | | | present |
| *Cossura candida* | 4 | | | | | | |
| *Diopatra ornata* | 4 | | | | | | |
| *Eumida* cf. *sanguinea* | 1+ | | | | | | |
| *Eumida*, other spp. | 1 | | 1 | | | 1 | |
| *Eunice americana* | 1 | | | ?2 | | | |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand, gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | → |
| **POLYCHAETES** | | | | | | | |
| *Glycera capitata* | 14 | 7 jv | 12 | 1 | | | ?1 |
| *Goniada brunnea* | 7 | 2 | 3 | | | | |
| *Haploscoloplos elongatus* | 11 | | | | | | |
| *Harmothoë*, nr *lunulata* | 10 | | | 1 | | | |
| *Laonice* sp. | 1 | 12 jv | 5 | | | | |
| *Lumbrineris bicirrata* | 3 lg | 8 | | 1 | | | |
| *Lumbrineris cruzensis* | many | 5 | 73 | | | | |
| *Lumbrineris*, other spp. | 1+ | | | | | 9 | |
| *Marphysa disjuncta* | 8 | | | | | | |
| *Myriochele gracilis* | 1 | | 2 | | | | |
| *Nephtys ?californiensis* | 21 | | | | | | |
| *Oxydromus a. glabrus* | 3 | | 1 | 4 | | | 2 |
| *Pherusa* spp. | 18 | | | | | | |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
|---|---|---|---|---|---|---|---|
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand, gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | → |
| **POLYCHAETES** | | | | | | | |
| *Pholoë glabra* | 149+ | 1 | 2 | | | | |
| phyllodocids, various | 3+ | | | | | | |
| *Pilargis maculata* | 1 | | 1 | | | | |
| *Pista* cf. *cristata*, small | 1+ | | | | | | |
| *Polydora* sp. | 1+ | | | | | | |
| *Praxillella a. pacifica* | 6 | | 3 | | | | |
| *Prionospio malmgreni* | 60 | 12 | 5 | 2 | | | |
| *Prionospio pinnata* | 24 | | 8 | 1 | 2 | | 2 |
| *Scalibregma inflatum* | 5 | | | | 1 giant | | |
| sigalionid | 1 | | | | | | |
| *Spiophanes missionensis* | 1+ | | 12 | 3 | | | |
| *Sthenelanella uniformis* | 1+ | 5 | | | | | |
| *Terebellides stroemi* | 5 | | | | | ?1 | ?1 |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
|---|---|---|---|---|---|---|---|
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand. gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | → |
| **POLYCHAETES** | | | | | | | |
| *Travisia* sp. | 3 | | | | | | |
| *Aricidea lopezi* | | 1 | | | | | |
| *Artacamella hancocki* | | 10 jv | | | | | |
| *Drilonereis ?nuda* | | 1 | | | | | |
| *Exogone uniformis* | | 2 | | | | | |
| *Glycera tesselata* | | 3 | | | | 3 | |
| *Lepidasthenia interrupta* | | 2 | | | | | |
| *Lysippe annectens* | | 2 | | | | | |
| *Maldanella robusta* | | 2 lg | | | | | |
| *Mediomastus californiensis* | | 2 | 5 | | | | |
| *Nephtys ferruginea* | | 2 | 2 | | | | |
| *Nerinides maculata* | | 1 | | | | | |
| *Onuphis parva* | | 2 | | | | | |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand, gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | (weights not taken) | | | | | | |
| **POLYCHAETES** | | | | | | | |
| *Paraonis gracilis* | | 1 | 1 | | | | |
| *Pectinaria californiensis* | | 4 | 28 | 65 | 1 | | |
| *Pherusa capulata* | | 2 jv | | | | | |
| *Pionosyllis*, unknown sp. | | 10 | | | | | |
| *Phyllochaetopterus limicolus* | | 1 | 2 | 1 | | 3 | |
| *Apistobranchus* sp. | | 1 | | | | | |
| *Telepsavus costarum* | | 3 | 1 | | | | |
| *Tharyx tesselata* | | 3 | 2 jv | | | | |
| *Ancistrosyllis tentaculata* | | | 8 | | 3 | | 1 |
| *Anaitides* spp. | | | 3 | | | 1 | |
| *Axiothella* sp. | | | 1 | | | | |
| *Decamastus gracilis* | | | 100+ | | | | |
| *Dorvillea articulata* | | | 2 | 14 | | | 1 |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
|---|---|---|---|---|---|---|---|
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand, gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | → |
| **POLYCHAETES** | | | | | | | |
| *Glycera americana* | | | 2 lg | 1 | | | |
| *Harmothoë* sp., reticulate | | | 1 | | | | |
| *Heteromastus filobranchus* | | | 98+ | 16 lg | | | |
| *Lumbrineris index* | | | 6 | | | | |
| *Maldane sarsi* | | | 14 | | | | |
| *Nereis procera* | | | 15 | | | | |
| *Nothria pallida* | | | 10 | 3 | | | |
| *Pherusa neopapillata* | | | 1 | | | | |
| *Spiophanes fimbriata* | | | 2 | | | | |
| *Brada pluribranchiata* | | | | 4 lg | | | |
| *Melinna heterodonta* | | | | 2 | | | |
| *Nephtys* sp. | | | | 12 jv | | | 8 |
| *Syllis* sp. | | | | 2 | | | |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
|---|---|---|---|---|---|---|---|
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand, gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | → |
| **POLYCHAETES** | | | | | | | |
| *Brada pilosa* | | | | | 16 | | 25 |
| ?*Dasybranchus* sp. | | | | | 5 | | |
| *Aricidea* sp. | | | | | 1 | | |
| *Spiophanes* sp. | | | | | 1 | | |
| *Acrocirrus crassifilis* | | | | | | 15 | |
| *Amphicteis* sp. | | | | | | 1 | |
| ?*Asclerocheilus* sp. | | | | | | 4 | |
| capitellid | | | | | | 2 | |
| *Cirratulus* sp. | | | | | | 1 | |
| cirratulid, other kind | | | | | | 4 | |
| *Euphrosine* sp. | | | | | | 1 | |
| *Evarnella fragilis* | | | | | | 1 | |
| ?*Hauchiella* sp. | | | | | | 1 | |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
|---|---|---|---|---|---|---|---|
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand, gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | → |
| **POLYCHAETES** | | | | | | | |
| *Lagisca* sp. | | | | | | 1 | |
| *Laonice foliata* | | | | | | 1 | |
| ?*Hypoeulalia* sp. | | | | | | 1 | |
| *Lepidonotus caelorus* | | | | | | 2 | |
| nereid | | | | | | 1 | |
| *Onuphis* sp. | | | | | | 1 | |
| *Pherusa* sp. | | | | | | 3 | |
| polydorid | | | | | | 10+ | |
| protulid | | | | | | present | |
| ?*Sige* sp. | | | | | | 1 | |
| syllid | | | | | | 3 | |
| *Amage* sp. | | | | | | | 1 |
| *Aricidea* sp. | | | | | | | present |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand, gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | → |
| **POLYCHAETES** | | | | | | | |
| *Capitella* sp. | | | | | | | 1 |
| *Ninoë gemmea* | | | | | | | 1 |
| *Pilargis* sp. | | | | | | | 1 |
| polynoid | | | | | | | 1 |
| sabellid | | | | | | | 1 |
| **ECHINODERMS** | | | | | | | |
| *Amphiodia digitata* | 388 | | | | | | |
| *Amphipholis squamata* | 43 | 3 | 1 | | | | |
| *Astropecten californicus* | 2 jv | | | | | | |
| *Leptosynapta albicans* | 1 | 2 | | | | | |
| holothuroid, others | 1 | | | | | 3 | |
| *Molpadia intermedia* | | 2 | | | | | |
| *Sclerasterias heteropaes* | | 1 | | | | | |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
|---|---|---|---|---|---|---|---|
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand, gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | → |
| **ECHINODERMS** | | | | | | | |
| *Brisaster townsendi* | | | 3 | | 1 | | |
| *Amphiodia urtica* | | | 9 | | | | |
| *Amphipholis pugetana* | | | | | | 49 | |
| *Brissopsis pacifica* | | | | | | 2 | 1 |
| *Ophiopholis bakeri* | | | | | | 3 | |
| *Ophiopholis longispina* | | | | | | 7 | |
| **MOLLUSKS** | | | | | | | |
| *Axinopsida serricatus* | 25 | | | | | | |
| *Balcis rutila* | 5 | | | | | | |
| *Cadulus fusiformis* | 7 | | | | | | |
| *Cardiomya pectinata* | 1 | | | | | | |
| *Compsomyax subdiaphana* | 7 | | | | | | |
| *Crystallophrisson* sp. | 1 | | | | | | |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
|---|---|---|---|---|---|---|---|
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand, gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | → |
| **MOLLUSKS** | | | | | | | |
| *Cylichnella diegensis* | 2 | | | | | | |
| *Cymatosyrinx halocydne* | 3 | | | | | | |
| *Macoma yoldiformis* | 3 | | | | | | |
| *Prochaetoderma* sp. | 4 | | | 1 | | | |
| *Rochefortia tumida* | 5 | | | | | | |
| *Solamen columbianum* | 6 | | | | | | |
| *Tellina carpenteri* | 1 | | | | | | |
| *Thyasira barbarensis* | 3 | | | | | | |
| *Volvulella tenuissima* | 12 | | 1 | | | | |
| *Amygdalum pallidulum* | | 241 | | | | | |
| clams, small, white | | many | | 6 | | | |
| *Nassarius* sp. | | several | | | | | |
| *Aglaja* sp. | | | 1 | | | | |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand, gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | (weights not taken) | | | | | | |
| **MOLLUSKS** | | | | | | | |
| *Bittium catalinense* | | | 43 | | | | |
| *Dentalium rectius* | | | 15 | | | | |
| *Lucinoma annulata* | | | 1 | | | | |
| *Parvilucina tenuisculpta* | | | 11 | | | | |
| *Yoldia scissurata* | | | 2 | | | | |
| *Acila castrensis* | | | | 6 | | | 1 |
| *Amphissa bicolor* | | | | present | present | | 3 |
| *Mitrella* sp. | | | | | | ca 30 | |
| *Xylophaga* spp. | | | | | | many | present |
| ?*Macoma* sp. | | | | | | | 1 |
| **CRUSTACEANS** | | | | | | | |
| amphipods | 100+ | many | 10+ | | | | |
| caprellids | | several | | | | | |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
|---|---|---|---|---|---|---|---|
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand, gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | → |
| **CRUSTACEANS** | | | | | | | |
| isopods | 9 | 1+ | | | | | |
| ostracods | ca 12 | | | | | | |
| cumaceans: | | | | | | | |
| *Diastylis*, nr *stygia* | | 1 | | | | | |
| *Eudorella* sp. | | 1 | | | | | |
| *Leptostylis*, nr *villosa* | | 1 | | | | | |
| ?*Oxyurostylis tertia* | | 1 | | | | | |
| *Procampylaspis* sp. | | 2 | | | | | |
| *Diastylis pellucida* | | | 1 | | | | |
| tanaids | | 1 | | | | | |
| *Scalpellum* sp. | | | | | | present | |
| pinnotherid crab | | present | | | | | |
| spider crab | | | | | | 2 jv | |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand, gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | → |
| **CRUSTACEANS** | | | | | | | |
| pycnogonid | | 1 | | | | | |
| **OTHERS** | | | | | | | |
| *Glottidia albida* | 7 | | | | | | |
| nemerteans | 3+ | | 3 lg | 3 lg | 2 lg | | 4 lg |
| echiuroid | 5 lg | | | | | | |
| enteropneust | 1 | | | | | | |
| polyclad | | | | 3 | | | |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Station number | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
| Depth in meters | 57 | 76 | 232 | 378 | 519 | 542 | 575 |
| Kind of sediment | clay | sand, gravel | mud | sand, mud | mud | mud | mud |
| Gear used | OPG | CG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 0.63 | unknown | 2.7 | grab filled | 1.95 | 0.5 | 1.38 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | → |
| **NUMBERS OF** | | | | | | | |
| **POLYCHAETES** Species | 39+ | 30 | 36 | 19 | 8 | 25+ | 14+ |
| Specimens | 532+ | 109 | 463 | 155 | 30 | 72+ | 47+ |
| **ECHINODERMS** Species | 5 | 4 | 3 | 0 | 1 | 5 | 1 |
| Specimens | 435 | 8 | 13 | 0 | 1 | 64 | 1 |
| **MOLLUSKS** Species | 15 | 1+ | 7 | 1+ | 1+ | 1+ | 4+ |
| Specimens | 85 | 241+ | 74 | 1+ | 2+ | 30+ | 11+ |
| **CRUSTACEANS** Species | 3+ | 5+ | 2 | 0 | 1 | 2+ | 0 |
| Specimens | 26+ | 6+ | 11 | 0 | 1 | 3+ | 0 |
| **OTHERS** Species | 2 | 0 | 1 | 2 | 1 | 0 | 2 |
| Specimens | 8 | 0 | 3 | 6 | 2 | 0 | 5 |
| **TOTALS** Species | 64+ | 40+ | 49 | 22+ | 12+ | 33+ | 21+ |
| Specimens | 1086+ | 364+ | 564 | 162+ | 36+ | 169+ | 64+ |

## REDONDO CANYON, SOUTH WALL *(Continued)*

| Station number . . . . . | 2359 | 6817 | 2191 | 6816 | 3167 | 2151 | 2150 |
|---|---|---|---|---|---|---|---|
| Characteristics of the screenings | fine debris with many small animals | sand, gravel, many small animals | fine mud with wormlike animals | fine mud with many wormlike animals | flocculent debris, mollusks, wormlike animals | siliceous sponge, ophiuroids, wormlike animals | wormlike animals |
| Largest species | none | *Maldanella, Cerebratulus* | *Arhynchite*, nemertean | *Arhynchite*, nemertean | *Scalibregma, Cerebratulus* | *Brissopsis* | nemertean |
| Most conspicuous or abundant species | *Chloeia pinnata, Pholoë glabra* | *Amygdalum* | *Heteromastus, Decamastus* | *Pectinaria, Chloeia pinnata* | *Brada pilosa, Amphissa* | *Amphipholis pugetana* | none |

## REDONDO CANYON, NORTH WALL

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | ← (weights not taken) → | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| *Aglaophamus dicirris* | 1 | | | 1 | | | | |
| ampharetids | 4 | | | | | | 2 | |
| *Anaitides* sp. | 2 jv | | | | | 1 | | |
| *Ancistrosyllis tentaculata* | 8 | 17 | | 1 | | 3 | | |
| *Aricidea lopezi* | 3 | 20 | 6 | | 5 | | | |
| *Aricidea ramosa* | 4 | | | | | | | |
| *Aricidea (C.) aciculata* | 6 | | | 5 | 2 | | | |
| *Artacamella hancocki* | 2 | | | | | | | |
| *Axiothella* sp. | 2 jv | | | | | | | |
| *Brada pilosa* | 1 jv | | 7 | | | 1 | | 1 |
| *Brada pluribranchiata* | 2 jv | | | 1 | 2 | | | |
| *Ceratocephala c. americana* | 2 jv | | | 1 | | | | |
| *Chloeia pinnata* | 10 | 1 | 24 | 22 | | | | 3 lg |

## REDONDO CANYON, NORTH WALL *(Continued)*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | (weights not taken) | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| *Cossura candida* | 1 | 23 | 1 | 2 | | 1 | | |
| *Driloncreis ?nuda* or sp. | 2 | | 1 | | 2 | | | |
| *Exogone uniformis* | 12 | | 7 | | | | | |
| *Glycera capitata* | 8 jv | 30 | 5 | 2 | 8 | | | |
| *Goniada brunnea* | 5 | 4 | 2 | 1 lg | 2 | 1 jv | | |
| *Haploscoloplos elongatus* | 12 | 1 jv | 1 jv | | | 3 | | |
| *Harmothoë*, nr *lunulata* | 8 | 1 jv | | | | 1 | | |
| *Harmothoë* sp., reticulate | 6 | | 9 | 12 | 5 | | | |
| *Lanice* sp. | 1- | | 10 | | | | 2 | |
| *Laonice ?cirrata* or sp. | 4 | 1 | | 7 | 3 | | | |
| *Lumbrineris bicirrata* | 2 lg | 1 | | 1 | | | | |
| *Lumbrineris limicola* | 54 sm | | | | 7 sm | | | |
| *Maldane sarsi* | 2 | 10 | 1 jv | | 2 jv | 4 | 50+ | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | (weights not taken) | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| *Megalomma splendida* | 1 jv | | | 2 lg | | | | |
| *Mediomastus californiensis* | 8 | 3 | 7 | | 1 | | | |
| *Myriochele gracilis* | 1 | | | | 2 | | 1 | |
| *Nephtys ferruginea* | 12 | 2 | 9 | 15 | ?21 | | | |
| *Nereis procera* | 1 jv | 7 | | | | ?1 | | |
| *Nerinides pigmentata* | 1 | | | | | | | |
| *Onuphis parva* | 2 | | 9 | 15 | 3 | | | |
| *Onuphis nebulosa* | 15 | | | | | | | |
| *Oxydromus a. glabrus* | 1 | 3 | 1 | | | 2 | | |
| *Paraonis gracilis* | 44 | 12 | 25 | 6 | 10 | | 2 | 1 |
| *Pectinaria californiensis* | 53 jv | 312 | 34 | 10 | 68 | 500+ | 1 | |
| *Pherusa neopapillata* | 4 jv | 2 | | | | | | |
| *Pholoë glabra* | 60 | 11 | 22 | 16 | 2 | | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | (weights not taken) | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| *Phyllochaetopterus limicolus* | 1 | | 3+ | 1 | | | | |
| *Pista* cf. *cristata*, small | 5 | | 20 | 10 | 2 | | | |
| *Polydora* sp. | 2 jv | | | | | | | 1 |
| *Praxillella a. pacifica* | 1 | 4 | | 1 | | | | |
| *Praxillella gracilis* | 1 | | 1 | 2 | | | | |
| *Prionospio pinnata* | 8 | 12 | 10 | 5 | 7 | | | 1 |
| *Prionospio malmgreni* | 63 (with *P. pygmaeus*) | 8 sm | 35 | 9 | 22 | | | |
| *Prionospio pygmaeus* | | | | | | | | |
| *Scalibregma inflatum* | 16 | | | 1 jv | | 1 | | |
| *Sphaerodoridium minutum* | 9 | | 4 | | | | | |
| *Spiophanes fimbriata* | 3 | 9 | | | | | | |
| *Spiophanes missionensis* | 12 | | 30 | 4 | 33 | | | |
| *Sternaspis fossor* | 2 | | 1 | 1 | 1 | | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | (weights not taken) | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| *Sthenelais tertiaglabra* | 7 | | | 2 | | | | |
| *Telepsavus costarum* | 1 | | | 1 | | | | |
| *Terebellides stroemi* | 10 | | 4 | 1 | 2 | | | 2 |
| *Tharyx monilaris* | 8 | 2 | 5 | 2 | 4 | | | |
| *Tharyx tesselata* or sp. | 10 | 9 | 10 | 5 | 4 | | | 2 |
| *Brada glabra* | | 1 | | | | | | |
| *Anaitides ?madeirensis* | | 1 lg | | | | | | |
| *Capitella capitata oculata* | | 1 | | | | | | |
| *Decamastus gracilis* | | 40 | | | | | | |
| *Disoma franciscanum* | | 2 | | | | | | |
| *Dorvillea articulata* | | 1 | | | | | | |
| *Eteone ?californica* | | 1 | | | | | | |
| *Eunice americana* | | 1 | | | | | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | ← (weights not taken) → | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| *Glycera americana* | | 4 | | | | | | |
| *Heteromastus filobranchus* | | 1 jv | | | | 102 | | 1- |
| *Langerhansia heterochaeta* | | 7 | | | | | | |
| *Lumbrineris cruzensis* | | 18 | 12 | 21 | | 1 | 3 | 1- |
| *Marphysa disjuncta* | | 4 | | | | 1 | | |
| *Ninoë gemmea* | | 5 | | | | | | |
| *Nothria ?pallida* | | 4 | | | | | 1 | |
| *Notomastus tenuis* | | 8 | | | | | | |
| *Owenia* sp. | | 1 | 12 | | | | | |
| *Pilargis berkeleyi* | | 1 | | | | | | |
| *Pilargis maculata* | | 1 | | | | | | |
| *Pista disjuncta* | | 2 | | | | | | |
| *Aricidea*, nr *suecica* | | | 2 | | | | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | (weights not taken) | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| *Chaetozone ?setosa* | | | 1 | | 7 | | | |
| *Chone* sp. | | | 2 | | 1 jv | | | |
| *Laonice foliata* | | | 1 lg | | | | | |
| *Leanira* sp., oculate | | | 3 | | | | | |
| *Lumbrineris bifilaris* | | | 1 | | | | | |
| *Lysippe annectens* | | | 1 | | 1 jv | | | 10 |
| *Nephtys* spp. | | | 15 jv | | | 3 sm | | |
| *Nerinides maculata* | | | 2 | | | | | |
| *Ophelia magna* | | | 1 lg | | | | | |
| *Panthalis pacifica* | | | 1 | 1 | | | | |
| *Pherusa* spp. | | | 1 jv | | | 1 sm | 2 | |
| *Prionospio cirrifera* | | | 5 | | | ?7 | | |
| *Sthenelais tertiaglabra* | | | 1 | | | | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | ← (weights not taken) → | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| *Travisia* sp. | | | 1 jv | 1 jv | | | | |
| *Ammotrypane aulogaster* | | | | 1 | | | 1 | |
| *Myriochele gracilis* | | | | 2 | | | | |
| ?*Diplocirrus* sp. | | | | | 2 | | | |
| *Lumbrineris californiensis* | | | | | 1 | | | |
| ?*Notomastus* sp. | | | | | 2 jv | | | |
| *Ophiodromus pugettensis* | | | | | 1 | | | |
| phyllochaetopterid | | | | | 1 | | | |
| *Praxillella* sp. | | | | | 2 jv | 1 | | |
| *Rhodine bitorquata* | | | | | 1 | | | |
| *Travisia pupa* | | | | | 1 lg | | | |
| *Euclymene* sp. | | | | | | 1 | | |
| *Glycinde armigera* | | | | | | 2 lg | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | (weights not taken) | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| *Melinna heterodonta* | | | | | | 2 lg | 2 | 4 lg |
| nereid, unknown | | | | | | 1 | | |
| *Spiophanes* sp. | | | | | | 3 | | |
| *Onuphis vexillaria* | | | | | | | 1 | |
| *Petaloproctus* sp. | | | | | | | 2 | |
| polynoid | | | | | | | 2 | |
| *Prionospio* sp. | | | | | | | 2 | |
| *Syllis* sp. | | | | | | | 1 | |
| ?*Thelepus* sp. | | | | | | | 1 | |
| *Amphicteis scaphobranchiata* | | | | | | | | 1 lg |
| *Anobothrus gracilis* | | | | | | | | 50+ |
| *Calamyzas* sp. | | | | | | | | 1 |
| *Califia calida* | | | | | | | | 1 |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | ← (weights not taken) → | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| *Glyphanostomum ?pallescens* | | | | | | | | 2 |
| sabellid, *?Chone* sp. | | | | | | | | 2 |
| *?Protis* sp. | | | | | | | | 1 |
| *Pista* sp. | | | | | | | | 1 |
| **ECHINODERMS** | | | | | | | | |
| *Amphiacantha amphacantha* | 11 | | 24 | 25 | 5 | | | |
| *Amphiodia digitata* | 39 | | | 109 | 21 | | | |
| *Amphioplus strongyloplax* | 4 | | 7 | 5 | 14 | | | |
| *Amphioplus hexacanthus* | 3 | | | 5 | 3 | | | |
| *Amphiodia urtica* | 87 | 9 | 88 | | 152 | | | |
| *Amphichondrius granulosus* | 1 | | | | | | | |
| *Amphipholis pugetana* | 4 | | | | | | 18 | |
| *Amphiura diastata* | 1 | | | | | | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | ← (weights not taken) → | | | | | | | |
| **ECHINODERMS** | | | | | | | | |
| *Brisaster townsendi* | 2 | | | | 3 | | | |
| *Leptosynapta albicans* | 7 | | 2 jv | 1 sm | | | | |
| *Amphipholis squamata* | | 3 | 23 | 6 | 11 | | | |
| *Amphipholis* sp.? | | | 1 jv | | | | | |
| *Brissopsis pacifica* | | | 1 | | 1 | | 1 | |
| *Ophiocnida* sp., disk only | | | 1 | | | | | |
| *Molpadia intermedia* | | | | 2 lg | | | | |
| *Amphiura arcystata* | | | | | 3 | | | |
| *Ophiura lütkeni* | | | | | 1 | | | |
| *Pentamera pseudopopulifera* | | | | | 1 | | | |
| *Ophiopholis bakeri* | | | | | | | 3 | |
| **MOLLUSKS** | | | | | | | | |
| *Acteocina culcitella* | 2 | | | | 1 | | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | (weights not taken) | | | | | | | |
| **MOLLUSKS** | | | | | | | | |
| *Aglaja* sp. | 1 | 2 | 3 sm | | | | | |
| *Amygdalum pallidulum* | 1 | | | 21 | 1 | | | |
| *Cadulus fusiformis* | 1 | 1 | | | | | | |
| *Cuspidaria apodema* | 5 | | | 2 | | | | |
| *Megasurcula carpenteriana* | 1 | | | | | | | |
| *Nucula carlottensis* | 2 | | | | | | | |
| *Nuculana hamata* | 1 | | | 3 | | | | |
| solenogasters | 3 | | | | 5 | | present | 1 |
| *Tellina carpenteri* | 1 | | | | 33 | | | |
| *Dentalium rectius* | | 149 | | 3 | 3 | | | |
| *Acteon punctocoelata* | | 1 | | | | | | |
| *Acila castrensis* | | 1+ | | 2 | ?10 | | | |
| *Fusinus arnoldi* | | 2 | | | | | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | | → |
| **MOLLUSKS** | | | | | | | | |
| *Lucinoma annulata* | | 2 | | | | | | |
| *Parvilucina tenuisculpta* | | 14 | | | | | | |
| *Solemya panamensis* | | 1 | | | | | | |
| *Tellina bodegensis* | | 1 | | | | | | |
| *Thyasira barbarensis* or sp. | | 3 | | 1 | 2 | | | |
| *Turbonilla* sp. | | 1 | | | | | | |
| *Yoldia scissurata* | | 13 | | | | | | |
| pelecypods, small | | | ca 75 | | 4 | | present | |
| gastropods, small | | | ca 20 | | | | present | |
| *Dentalium* sp. | | | 2 | | | | | |
| *Axinopsida serricatus* | | | 16 | 11 | 16 | | | |
| *Cadulus tolmiei* or spp. | | | | 6 | | | 14 | |
| *Cylichnella diegensis* | | | | 4 | | | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | (weights not taken) | | | | | | | |
| **MOLLUSKS** | | | | | | | | |
| *Adontorhina cyclia* | | | | 16 | 38 | | | |
| *Cardiomya pectinata* | | | | 6 | | | | |
| *Macoma incongrua* | | | | 2 | | | | |
| *Leda* sp. | | | | 1 | | | | |
| *Balcis* sp. | | | | | 1 | | | |
| *Bittium rugatum subplanatum* | | | | | 7 | | | |
| *Cardiomya californica* | | | | | 1 | | | |
| *Cardita ventricosa* | | | | | 5 | | | |
| *Lucina* sp. | | | | | 1 | | | |
| *Macoma* sp. | | | | | ?1 | | | |
| *Nemocardium centifilosum* | | | | | 2 | | | |
| *Nucula* sp. | | | | | 1 | | | |
| *Mangelia* sp. | | | | | 1 | | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | (weights not taken) | | | | | | | |
| **MOLLUSKS** | | | | | | | | |
| *Pseudopythina chacei* | | | | | 9 | | | |
| *Rochefortia* sp. | | | | | ?1 | | | |
| *Saxicavella pacifica* | | | | | 3 | | | |
| *Volvulella* sp. | | | | | 1 | | | |
| *Turcicula bairdi* | | | | | | | | 1 lg |
| *Mitrella permodesta* | | | | | | | | 2 |
| **CRUSTACEANS** | | | | | | | | |
| Amphipods | 10+ | 13 | 9 | | | | | |
| *Heterophoxus* sp. | | | 7 | 12 | | | | |
| *Metaphoxus* sp. | | | 18 | 19 | | | | |
| *Phoxocephalus* sp. | | | 4 | 3 | | | | |
| *Pontharpinia* sp. | | | 21 | 13 | | | | |
| *Pontharpinia*, another sp. | | | 4 | 2 | | | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120. | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | (weights not taken) | | | | | | | |
| **CRUSTACEANS** | | | | | | | | |
| *Pontharpinia*, a third sp. | | | | 2 | | | | |
| *Ampelisca brevisimulata* | | | | | 2 | | | |
| lysianassids, 2 spp. | | | | | 6 | | | |
| *Heterophoxus oculatus* | | | | | 21 | | | |
| *Metaphoxus frequens* | | | | | 44 | | | |
| oedicerotid | | | | | 11 | | | |
| *Photis* sp. | | | | | 2 | | | |
| *Phoxocephalus homilis* | | | | | 13 | | | |
| *Paraphoxus bicuspidatus* | | | | | 11 | | | |
| *Paraphoxus similis* | | | | | 3 | | | |
| *Paraphoxus robustus* | | | | | 1 | | | |
| *Urothoe varvarini* | | | | | 1 | | | |
| *Paraphoxus* sp. | | | | | | 1 | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | ← (weights not taken) → | | | | | | | |
| **CRUSTACEANS** | | | | | | | | |
| *Pontharpinia* sp. | | | | | | 1 | | |
| *Harpinia* sp. | | | | | | | 1 | |
| *Leptophoxus* sp. | | | | | | | 2 | |
| caprellids | | | 20 | | | | | |
| isopods | | | | | | | | |
| *Haliophasma geminata* | 9 | | 3 | 2 | 2 | | | |
| *Ilyarachna acarina* | 1 | | 14 | | | | | |
| *Munna* sp. | | | 3 | 1 | | | | |
| *Gnathia crenulatifrons* | | | | | 2 | | | |
| tanaids | 4 | | 7 | | 6 | | | |
| ostracods | 50 + | 13 | 105 | 8 | 49 | | | |
| cumaceans | | | | | | | | |
| *Diastylis*, nr *stygia* | 2 | | 4 | | | | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | ← | | | (weights not taken) | | | | → |
| **CRUSTACEANS** | | | | | | | | |
| *Eudorella pacifica* | 3 | | 30 | 12 | | | | |
| *Leucon subnasica* | 1 | | | | | | | |
| *Procampylaspis* sp. | 1 | | 2 | | | | | |
| *Cumella* sp., heavily dentate | | | 5 | | | | | |
| *Leptostylis*, nr. *villosa* | | | 4 | | | | | |
| *Campylaspis*, sp. | | | 1 | | | | | |
| *Eudorellopsis longirostris* | | | | 1 | | | | |
| *Eudorella* sp. | | | | | 25 | | | |
| diastylid | | | | | 3 | | | |
| **OTHERS** | | | | | | | | |
| *Monobrachium*, colonies | 50 | | 16 | | | | | |
| sea whip | 1 | | | | | | | 1 sm |
| sipunculid | 1 | | | 2 | 1 sm | 1 | | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | (weights not taken) | | | | | | | |
| **OTHERS** | | | | | | | | |
| polyclad | 1 | | 1 | | | | | |
| nemerteans | 2 sm | 3 sm | 3 | 1 | 1 sm | 2 sm | | |
| *Listriolobus pelodes* | 1 lg | | | | | | | |
| *Arhynchite* sp. | | | | | 2 lg | 2 lg | 2 lg | |
| ?*Cerebratulus* sp. | | | | | | 2 lg | | |
| enteropneusts | | | | | | 2 | | |
| ceriantharian | | | | | | | 3 | |
| [sponge, long pannicled] | | | | | | | 1 | |

## REDONDO CANYON, NORTH WALL *(Continued)*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Station number | 2725 | 2192 | 3385 | 2727 | 5960 | 3166 | 2793 | 3168 |
| Depth in meters | 107 | 113 | 120 | 122 | 146 | 363 | 465 | 554 |
| Kind of sediment | mud | mud | mud | mud | sand | mud | mud, rock | mud |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.13 | 1.51 | 1.78 | 1.76 | 1.26 | 2.52 | 0.95 | 2.08 |
| Wt. of animals, gms. | ← (weights not taken) → | | | | | | | |
| **NUMBERS OF** | | | | | | | | |
| **POLYCHAETES** Species | 56 | 45 | 47 | 37 | 36 | 24 | 17 | 19 |
| Specimens | 524 | 609 | 357 | 191 | 240 | 644 | 76 | 86 |
| **ECHINODERMS** Species | 10 | 2 | 8 | 7 | 11 | 0 | 3 | 0 |
| Specimens | 159 | 12 | 147 | 153 | 215 | 0 | 22 | 0 |
| **MOLLUSKS** Species | 10 | 13 | 5 | 13 | 23 | 0 | 1+ | 3 |
| Specimens | 18 | 191 | 116 | 78 | 147 | 0 | 14+ | 4 |
| **CRUSTACEANS** Species | 6 | 2+ | 13 | 10 | 17 | 2 | 2 | 0 |
| Specimens | 77 | 26 | 257 | 76 | 202 | 2 | 3 | 0 |
| **OTHERS** Species | 6 | 1 | 3 | 2 | 3 | 5 | 4 | 1 |
| Specimens | 56 | 3 | 20 | 3 | 4 | 9 | 7 | 1 |
| **TOTALS** Species | 88 | 63+ | 76 | 69 | 90 | 31 | 27 | 23 |
| Specimens | 834 | 841 | 897 | 501 | 808 | 655 | 122+ | 91 |

## REDONDO CANYON, NORTH WALL *(Continued)*

| Station number - - - - - | Characteristics of the screenings | Largest species | Most conspicuous or abundant species |
|---|---|---|---|
| 2725 | 8 liters fine to coarse gravel, shell fragments, many animals | *Listriolobus pelodes* | *Amphiodia urtica*, *Prionospio* spp. |
| 2192 | silt with many wormlike animals, and tubes | none | *Pectinaria* |
| 3385 | shell and tube fragments, many animals, debris | none | *Amphiodia urtica*, *Pectinaria* |
| 2727 | biol. debris with many animals | *Megalomma splendida* | *Amphiodia digitata* |
| 5960 | biol. debris with ophiuroids, other animals | *Brisaster*, *Arhynchite* | *Amphiodia urtica*, *Pectinaria* |
| 3166 | arenac. forams., dead *Dentalium*, wormlike animals | *Cerebratulus* | *Pectinaria*, *Heteromastus* |
| 2793 | rubbly mud, forams., siliceous sponge, diversified animals | *Arhynchite* | *Maldane sarsi* |
| 3168 | forams., shell fragments, wormlike animals | *Turcicula* | *Anobothrus* |

## REDONDO CANYON, IN AXES DEPTHS

| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand, mud | mud, sand | mud, sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | | ... | 170.04 | | ... | ... | 75.58 | | 123.8 | 44.7 | 266.42 | 21.02 |
| **POLYCHAETES** | | | | | | | | | | | | | |
| *Anaitides* sp. | ?1 | 2 | 1 | | | | 1 | | 4 | | | | ?1 |
| *Ancistrosyllis tentaculata* | 238+ | 50 | 2 | 12 | | 2 | 1 | | | | 1 | | |
| *Aricidea lopezi* | 6 | 44 | | | | | | | | | | ?3 | 2 |
| *Capitella capitata* subspp. | 1 | 17 | | | | 27 | 133 | | | | | | |
| *Ceratocephala c. americana* | 1 | | | | | | | | | | | | |
| *Chloeia pinnata* | 126 lg | 25 | 61 | 4 | 55 | 20+ | 37 jv | 90 | 1 | | | | |
| *Cossura candida* | 8 | 2 | 1 | | | | | | 2 | | | | |
| *Disoma franciscanum* | 2 | | | | | | | | | | | | |
| *Dorvillea articulata* | 57 | 1 | 2 | 13 | 3 | 1 | | 4 | | 7 | | | |
| *Eteone* sp. | 1 jv | | | | | | | | | | | | |
| ?*Euclymene* sp. | 2 | | | | | | | | | | | | |
| *Eulalia*, 3-lined | 1 | | | | | | | | | | | | |
| *Glycera americana* | 4 | | | | | | 1 lg | | 1 lg | | | | |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand, mud | mud, sand | mud, sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | ........ | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | ........ | ........ | 170.04 | ........ | ........ | ........ | 75.58 | ........ | 123.8 | 44.7 | 266.42 | 21.02 |
| **POLYCHAETES** | | | | | | | | | | | | | |
| *Glycera capitata* | 10 | 14 | 2 | 1 | 1 | 4 | 1 jv | 2 | | ?1 sm | 2 | ?3 sm | |
| *Glycera robusta* | 1 lg | | | | | 1 jv | | | | | | | |
| *Goniada brunnea* | 9 | 3 | 2 | | 3 | 2 | 2 | | 1 | 7 lg | 7 | ?5 jv | |
| *Haploscoloplos elongatus* | 1 | 2 | 6 | 1 | 10 | 2 | 1 | | | | | | |
| *Harmothoë priops* | 1 | | | | 4 | | | | | | | | |
| *Laonice foliata* | 4 lg | 1 lg | | 2 lg | | 2 | | 4 | | | | 1 | |
| *Lepidasthenia* sp. | 1 | 2 lg | | | | 1 | | | | | | | |
| *Lumbrineris bicirrata* | 1 | 1 | | | 1 | | 1 lg | 5 | | 1 lg | 1 sm | 1 | |
| *Lumbrineris cruzensis* | 12 | 23 | 3 | | 2 | 4 | 1 | | | 5 | | | |
| *Lumbrineris index* | 5 lg | 1 | 6 lg | 3 | 2 | 1 lg | | 5 lg | | | 4 lg | 17 | |
| *Mediomastus californiensis* | 8 | 4 | | | 4 | 1 | 1 | | | | | | |
| *Nephtys* spp. | 5 | | | | | 5 jv | | | 2+ | 2 jv | | | |
| *Nereis procera* | 6 lg | | | | | | | | | | | | |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand, mud | mud, sand | mud, sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | ........ | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | ........ | ........ | 170.04 | ........ | ........ | ........ | 75.58 | ........ | 123.8 | 44.7 | 266.42 | 21.02 |
| **POLYCHAETES** | | | | | | | | | | | | | |
| *Ninoë gemmea* | 4 | 1 | | | | | | | | | | | |
| *Nothria pallida* | 25 | 12 | 2 | 6 | 2 | 2 jv | | 1 | | | ?1 | | |
| *Onuphis vexillaria* | 1 jv | | | | | | | 3 jv | | 2 | ?1 | 8 lg | 3 lg |
| *Oxydromus a. glabrus* | 28 | | | | | | | 3 | | 2 | | | |
| *?Pareurythoë* sp. | 3 | | | 1 | | | | | | | | | |
| *Pectinaria californiensis* | 580 lg | 96 | 5 | dd | 6 | | 63 | 195 | 50+ | 136 | 5 sm | | |
| *Pholoë glabra* | 14 | 1 | | | | | | | | | | | |
| *Pista disjuncta* | 12 lg | | | | | | | 1- | | | | | |
| *Prionospio cirrifera* | 8 | 46 | | | | 40 | 39 | | 8 | | 4 | ?3 | |
| *Prionospio malmgreni* | 7 | 26 | | | 3 | | 4 | | | | | | |
| *Prionospio pinnata* | 7 lg | 33 | 2 | 4 | 12 | | 6 lg | ?5 | 8 | 13 | 22 | 13 | 6 lg |
| *Spiophanes fimbriata* | 8 lg | 3 | 1 | 3 | | | 4 | 119 lg | | 17 | 2 | | |
| *Tharyx tesselata* | 1 | 5 | 2 | ?1 jv | | | 1 | | | | | | |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand, mud | mud, sand | mud, sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | ... | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | .. | ..... | 170.04 | . | ...... | ........ | 75.58 | ........ | 123.8 | 44.7 | 266.42 | 21.02 |
| **POLYCHAETES** | | | | | | | | | | | | | |
| *Typosyllis* sp. | 4 | | | | | | | | | | | | |
| *Amaeana occidentalis* | | 1 jv | | | | | | | | | | | |
| *Brada pilosa* | | 2 | | | | | 3 | | 5 | | 61 | 25 | |
| *Glycinde armigera* | | 2 | | | | | 1 | | | | | | |
| *Harmothoë*, nr *lunulata* | | 2 | 1 | | | 1 | 2 | 2 | | | 2 | | |
| *Heteromastus filobranchus* | | 24 lg | 10+ | 6 | | 54 | 22 | 6 | | 4 | 28 lg | 14 | |
| *Magelona sacculata* | | 1 | | | | | | | | | | | |
| *Nephtys ferruginea* | | 4 | | | | | ?14 | | | | | | |
| *Onuphis parva* | | 1 | | | | | 1 | | | | | | |
| *Pilargis maculata* | | 1 | | | | | | | | | | | |
| *Praxillella a. pacifica* | | 1 | | | | | | | | | | | |
| syllid | | 1 | | | | | | | | | | | |
| *Maldane sarsi* | | | 2 | 1 sm | 1 | | 1 jv | | | | | | 1 |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand, mud | mud, sand | mud, sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | | . . . | 170.04 | | . | . . . | 75.58 | . | 123.8 | 44.7 | 266.42 | 21.02 |
| **POLYCHAETES** | | | | | | | | | | | | | |
| *Pherusa neopapillata* | | | 1 | | | 2 | 5 | 2 | | | | | |
| *Phyllochaetopterus limicolus* | | | 1 | 1 lg | 1 | | | 1 lg | | | tube | | |
| *Terebellides stroemi* | | | 1 | | | | | | | | | | |
| *Aglaophamus erectans* | | | | 1 lg | 8 | | | 9 | | | | | |
| *Amphiduros* sp. | | | | 1- | | | | | | | | | |
| ?*Anobothrus* | | | | 1 | | | | | | | | | |
| *Asychis disparidentata* | | | | 1 | | | | | | | | | |
| *Brada pluribranchiata* | | | | 3 | | | | 1 | | 1 lg | | | |
| *Eumida* sp. | | | | 1 | | | | | | | | | |
| *Eunice americana* | | | | 1 lg | | | 1 jv | | | | | | |
| *Hesperonoë laevis* | | | | 1 | | | | | | 2 | | | |
| *Melinna heterodonta* or sp. | | | | 1 lg | | | 1 jv | 1 | | 5 lg | | | 2 |
| *Nereis* sp. | | | | 5 | | 1 | | | | | | 1 jv | |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand, mud | mud, sand | mud, sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | ........ | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | ........ | ........ | 170.04 | ........ | ........ | ........ | 75.58 | ........ | 123.8 | 44.7 | 266.42 | 21.02 |
| **POLYCHAETES** | | | | | | | | | | | | | |
| *Paraonis gracilis* or subsp. | | | | 1 | 1 | 2 | 4 | | | | | | 1 |
| *Pilargis berkeleyi* | | | | 1 | | | | | | | | | |
| *Telepsavus costarum* | | | | 1 | | | 1 | 3 | | | | | |
| *Ancistrosyllis breviceps* | | | | | 1 | | | 1 | | 2 | 1 lg | | |
| *Aricidea lopezi* | | | | | 2 | | | | | | | | |
| *Dorvillea moniloceras* | | | | | 3 | | | | | | | | |
| *Harmothoë* sp. | | | | | 4 | | | | | | | | |
| harmothoid | | | | | 3 | | | | | | | | |
| *Lumbrineris bifilaris* | | | | | 2 | | | | | | | | |
| *Lumbrineris ?tetraura* | | | | | 4 sm | | | | | | | | |
| *Notomastus tenuis* | | | | | 1 | | | | | | | | |
| *Onuphis* sp. | | | | | 1- | | | | | | | | |
| *Oxydromus* sp. | | | | | 3 | | | | | | | | |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand, mud | mud, sand | mud, sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | ..... | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | | ...... | 170.04 | ..... | ..... | ..... | 75.58 | ..... | 123.8 | 44.7 | 266.42 | 21.02 |
| **POLYCHAETES** | | | | | | | | | | | | | |
| *Spiophanes ?pallidus* | | | | | 2 | | | | | | | | |
| *Tharyx monilaris* | | | | | 6 | | 2 | | | | | | |
| *Harmothoë* sp. | | | | | 4 | | | | | | | | |
| *Travisia pupa* | | | | | | 1 | 1 | | | | | | |
| *Aglaophamus dicirris* or spp. | | | | | | | 1 | | | | 7 | | |
| *Axiothella* sp. | | | | | | 1 jv | | | | | | | |
| *Chaetozone* sp. | | | | | | 2 jv | | | | | | | |
| *Chone* sp. | | | | | | 1 jv | | | | | | | 1 jv |
| *Eteone californica* | | | | | | 1 | | | | | | | |
| flabelligerid | | | | | | 1 | | | | | | | 1 |
| *Scalibregma inflatum* | | | | | | 1 | | | 3 | | 1 | | |
| *Euclymene* | | | | | | 1 | | | | | | | |
| *Glycinde* sp. | | | | | | | | | 7 | 1 | | | 2 |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand, mud | mud, sand | mud, sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | ........ | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | ........ | ........ | 170.04 | ........ | ........ | ........ | 75.58 | ........ | 123.8 | 44.7 | 266.42 | 21.02 |
| **POLYCHAETES** | | | | | | | | | | | | | |
| *Anobothrus gracilis* | | | | | | | | | | 4+ | | | 78 |
| *Antinoella* sp. | | | | | | | | | 1 | | | | |
| *Aphrodita japonica* | | | | | | | | | 1 lg | | | | ?1 lg |
| capitellid | | | | | | | | | 1 | | | | |
| cirratulids | | | | | | | | | 2+ | | | | 1 lg |
| *Glycera* sp. | | | | | | | | | 1 | | | | |
| maldanids | | | | | | | | | 10+ | | | | |
| *Marphysa disjuncta* | | | | | | | | | 1 | | | | |
| *Myriochele gracilis* | | | | | | | | | 8 | | | | 3 |
| *Pherusa* sp. | | | | | | | | | 2+ | | | | |
| ?*Potamethus* sp. | | | | | | | | | 2 | | | | |
| *Streblosoma crassibranchia* | | | | | | | | | 1- | | | | |
| *Nephtys cornuta* | | | | | | | | | | | | 2 | |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand, mud | mud, sand | mud, sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | ........ | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | | ... | 170.04 | . | . | ... | 75.58 | ... | 123.8 | 44.7 | 266.42 | 21.02 |
| **POLYCHAETES** | | | | | | | | | | | | | |
| *Amphicteis scaphobranchiata* | | | | | | | | | | | | | 2 lg |
| *Lysippe annectens* | | | | | | | | | | | | | 4 |
| **ECHINODERMS** | | | | | | | | | | | | | |
| *Amphipholis squamata* | 1 | 1 | | | 3 | | 12 | 5 | | | | 8 | 2 |
| *Amphiacantha amphacantha* | 1 | | | | | | | | | | | | |
| *Amphiodia digitata* | | 3 | | | | | | | | | | | |
| *Brisaster townsendi* | | | 1 lg | 3 lg | 5 | 3 | 1 | 1 | 2 | 1 | 2 lg | 1 | 14 |
| *Amphiodia urtica* | | | | | 2 | | 7 | 2 | | | 1 | | |
| *Leptosynapta albicans* | | | | | | 1 frg | 8 | | | | | | |
| ophiuroid | | | | | | | | | 1+ | | | | |
| *Amphiura diastata* | | | | | | | | | | | 1 | | |
| *Brissopsis pacifica* | | | | | | | | | | | | 7 | |
| *Myxoderma platyacanthum* | | | | | | | | | | | | | 1 lg |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand, mud | mud, sand | mud, sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | . | . ... | 170.04 | . . . | . .. | ........ | 75.58 | . | 123.8 | 44.7 | 266.42 | 21.02 |
| **MOLLUSKS** | | | | | | | | | | | | | |
| *Acteon* sp. | pres | 5 | | | | | | | | | | | |
| *Compsomyax* sp. | pres | | | | | | | | | | | | |
| *Dentalium rectius* | pres | 20+ | 1 | 32 | | | | | | | | | |
| *Pandora* sp. | 1 | | | | | | | | 3 | | | | |
| *Yoldia scissurata* | pres | 27 | 3 | 5 | | | | | | | | | |
| sea slug | 2 | | | | | | | | | 1 | | | |
| *Acila castrensis* | | 6 | 1 | | | | | | | | | | |
| *Aglaja* sp. | | 3 | | | | | | | | | | | |
| *Bittium* sp. | | 10+ | | | | | | | 1 | | | | |
| *Solemya* sp. | | 2 | | 2 | | | | | | | | | |
| solenogasters | | | | 2 | | | 9 | 1 | 2 | 1 | 6 | 1 | |
| *Saxicavella* sp. | | | 1 | | | | | | | 18 | | | |
| *Parvilucina* | | | | pres | | | | | | | | | |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand mud | mud, sand | mud, sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | | | 170.04 | | | | 75 58 | | 123 8 | 44.7 | 266.42 | 21.02 |
| **MOLLUSKS** | | | | | | | | | | | | | |
| pelecypods, small | | | | | | 20+ | | | | | | | |
| gastropods, small | | | | | | | | 6 | | | | | |
| *Axinopsida serricatus* | | | | | | | | | 12 | | | | |
| *Balcis rutila* | | | | | | | | | 6 | | | | |
| *Cadulus tolmiei* | | | | | | | | | 33 | | | | |
| *Cardiomya pectinata* | | | | | | | | | 1 | | | | |
| *Macoma incongrua* | | | | | | | | | 323 | | | | |
| *Nuculana conceptionis* | | | | | | | | | 42 | | | | |
| *Nuculana spargana* | | | | | | | | | 8 | | | | |
| *Solamen columbianum* | | | | | | | | | 1 | | | | |
| *Sphenia globula* | | | | | | | | | 5 | | | | |
| *Tellina carpenteri* | | | | | | | | | 61 | | | | |
| *Thyasira barbarensis* | | | | | | | | | 1 | | | | |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand, mud | mud, sand | mud, sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | ... | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | | ... | 170.04 | | | ... | 75.58 | | 123.8 | 44.7 | 266.42 | 21.02 |
| **MOLLUSKS** | | | | | | | | | | | | | |
| *Amphissa* sp. | | | | | | | | | | 1 | | 10+ | 3 |
| *Malletia pacifica* | | | | | | | | | | | 1 | | |
| *Eulima* sp. | | | | | | | | | | | | 1 | |
| *Macoma leptonoidea* | | | | | | | | | | | | | 1 |
| *Mitrella permodesta* | | | | | | | | | | | | | 30 |
| **CRUSTACEANS** | | | | | | | | | | | | | |
| amphipods | 6 | 1 | 3 | 9 | | 3+ | | 1 | 11 | | 17 | 5 | 1 |
| caprellids | | 5 | | | | | | | | | | | |
| isopod | | | | | | | | | | | 1 | | |
| tanaid | | | | | | | | | | | | | 1 |
| ostracods | sev. | 2 | pres | | | | 10 | | 50+ | | | | |
| cumaceans | | | | | | | | | 5 | | | | |
| *Diastylis* sp. | 1 | | | | | | | 1 | | | | | |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand, mud | mud, sand | mud, sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | ........ | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | ........ | ........ | 170.04 | ........ | ........ | ........ | 75.58 | ........ | 123.8 | 44.7 | 266.42 | 21.02 |
| **CRUSTACEANS** | | | | | | | | | | | | | |
| *Diastylis pellucida* | | | | 3 | | | | | | | 1 | 10 | 1 |
| *Leucon* sp. | | | | | | | | | | | 6 | | |
| *Campylaspis* sp. | | | | | | | | | | | | | 1 |
| *Procampylaspis* sp. | | | | | | | | | | | | | 1 |
| copepod, parasitic | | | | | | | 3 | | | | | | |
| ghost shrimp | | | | | | | | | | | | | 1 |
| pinnixid crab | 2 | 2 | | | | 1+ | | | | | | | |
| **OTHERS** | | | | | | | | | | | | | |
| hydroid | | 1 | | | | | | | | | | | |
| nemerteans | | 11 | 1+ | 6 lg | | 3 lg | 2 | 3 | 2+ | 6 | 2 lg | 3 | 2 sm |
| echiuroid, thalassemid | | | 3 | 1 | | 4 lg | 1 | 1 | | 2 lg | 2 lg | | |
| enteropneusts | | | | | | 1 lg | 1 frg | | | | 3 | | |
| anemone | | | | | | | | 1 | | | 2 | | |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand, mud | mud, sand | mud sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | ........ | ........ | 170.04 | | . | . . | 75.58 | . | 123.8 | 44.7 | 266.42 | 21.02 |
| **OTHERS** | | | | | | | | | | | | | |
| polyclad | | | | | | | | | | 1 | 4 | 4 | |
| leech | | | | | | | | | | 1 | | | 1 |
| oligochaete | | | | | | | | | | | | 7 | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| Station number | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 137 | 148 | 239 | 246 | 282 | 298 | 344 | 378 | 422 | 431 | 503 | 560 | 611 |
| Kind of sediment | sand | mud | mud | mud | mud | mud | sand, mud | mud, sand | sand, mud | mud, sand | mud, sand | mud, coarse sand | mud |
| Gear used | CG | OPG | OPG | CG | CG | OPG | OPG | CG | OPG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 3.59 | 2.83 | 2.70 | 5.59 | | 2.80 | 3.02 | 2.5 | 1.87 | 4.73 | 3.01 | 2.29 | 4.30 |
| Wt. of animals, gms. | 222.25 | ........ | ........ | 170.04 | ........ | ........ | ........ | 75.58 | ........ | 123.8 | 44.7 | 266.42 | 21.02 |
| **NUMBERS OF** | | | | | | | | | | | | | |
| **POLYCHAETES** Species | 40 | 36 | 21 | 28 | 31 | 29 | 32 | 22 | 26 | 18 | 16 | 13 | 15 |
| Specimens | 1214 | 455 | 114 | 78 | 155 | 184 | 356 | 463 | 122 | 212 | 149 | 96 | 107 |
| **ECHINODERMS** Species | 2 | 2 | 1 | 1 | 3 | 2 | 4 | 3 | 2 | 1 | 4 | 3 | 3 |
| Specimens | 2 | 4 | 1 | 3 | 10 | 4 | 28 | 8 | 3 | 1 | 4 | 16 | 17 |
| **MOLLUSKS** Species | 2+ | 7 | 4+ | 5+ | 3+ | 1+ | 1 | 2 | 15 | 4 | 2 | 3 | 3 |
| Specimens | 3+ | 73 | 6+ | 41+ | 34+ | 20+ | 9 | 7 | 519 | 21 | 7 | 12 | 34+ |
| **CRUSTACEANS** Species | 2 | 4 | 1+ | 2 | | 2+ | 2+ | 2 | 5 | 0 | 3 | 2 | 4 |
| Specimens | 8 | 10 | 3+ | 12 | | 4+ | 11+ | 2 | 66 | 0 | 25 | 15 | 4 |
| **OTHERS** Species | 0 | 4 | 2 | 2 | 2 | 3 | 4 | 3 | 1 | 4 | 5 | 4 | 2 |
| Specimens | 0 | 13 | 2+ | 7 | 3 | 8 | 7 | 5 | 2+ | 10 | 13 | 14 | 3 |
| **TOTALS** Species | 46+ | 53 | 29+ | 38+ | 39+ | 37+ | 43+ | 32 | 49 | 27 | 30 | 25 | 27 |
| Specimens | 1227+ | 555 | 126+ | 141+ | 202+ | 220 | 411 | 485 | 712+ | 244 | 198 | 153 | 165+ |
| | | | | | | | | | | | | | |

## REDONDO CANYON, IN AXES DEPTHS *(Continued)*

| Station number . . . . . | 7284 | 3164 | 2149 | 7285 | 6815 | 2148 | 2190 |
|---|---|---|---|---|---|---|---|
| Characteristics of the screenings | black shelly sand, debris, odor of $H_2S$, many worms | detritus, broken shells, tubes, waxy lumps, $H_2S$, worms | black mud with many animals, foraminiferans | black mud, fecal pellets, oil blobs, many animals | gray mud with large and small animals, oil blobs | plant and woody debris, broken *Pectinaria*, many animals | broken *Pectinaria* tubes, many animals |
| Largest species | *Glycera robusta* | *Praxillella a. pacifica* | *Arhynchite*, *Brisaster*, *Lumbrineris index* | *Brisaster*, *Arhynchite* | *Brisaster*, *Cerebratulus* | ?*Arhynchite*, *Cerebratulus*, enteropneust | *Glycera americana*, *Lumbrineris bicirrata* |
| Most abundant or conspicuous species | *Pectinaria*, *Ancistrosyllis*, *Chloeia* | *Pectinaria*, *Prionospio* spp., *Ancistrosyllis* | *Chloeia*, *Heteromastus* | *Dentalium rectius* | none | *Chloeia*, *Heteromastus* | *Capitella*, *Pectinaria* |

| Station number . . . . . | 7286 | 2189 | 7287 | 7288 | 7289 | 7290 |
|---|---|---|---|---|---|---|
| Characteristics of the screenings | gray mud and sand, many animals | sandy mud with many animals | sandy mud with many animals | gray sand with black fecal pellets, many animals | very coarse sand, green mud, many animals | green mud |
| Largest species | *Brisaster* | *Glycera americana* | *Brissopsis*, ?*Arhynchite*, *Aphrodita* | *Brisaster*, *Lumbrineris index* | *Brissopsis* and *Brisaster* | *Myxoderma*, *Onuphis vexillaria* |
| Most abundant or conspicuous species | *Pectinaria*, *Spiophanes fimbriata* | *Chloeia*, *Pectinaria* | *Pectinaria* | *Brada pilosa*, *Heteromastus* | brissopsids, *Brada pilosa*, *Lumbrineris index* | ampharetids, *Mitrella* |

## REDONDO CANYON, BASIN SLOPE

| Station number | 2789 | 2361 | 2790 | 2792 |
|---|---|---|---|---|
| Depth in meters | 167 | 310 | 334 | 556 |
| Kind of sediment | mud, sand | mud | mud | mud |
| Gear used | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.7 | 1.44 | 2.33 | 2.77 |
| Wt. of animals, gms. | ← | (not taken) | → | 15.2 |
| **POLYCHAETES** | | | | |
| *Amage anops* | 1 | | | |
| *Ampharete arctica* | ?1 | 1 | | |
| *Anaitides madeirensis* | 1 | 6 | | |
| *Aricidea (C.) aciculata* | 6 | 7 | | 1 |
| *Aricidea lopezi* | 7 | 1 | | |
| *Artacamella hancocki* | 2 | | | |
| *Chloeia pinnata* | 33 | 9 | | |
| *Drilonereis ?longa* | 5 | 3 | | |
| *Glycera capitata* | 5 | 3 jv | | |
| *Goniada brunnea* | 1 | 3 | 1 | |
| *Harmothoë* sp., reticulate | 4 | 2 | 1 | |
| *Hesperonoë laevis* | 1 | 4 | 1 | |
| *Laonice foliata* | ?4 | | | |

## REDONDO CANYON, BASIN SLOPE *(Continued)*

| | | | | |
|---|---|---|---|---|
| Station number | 2789 | 2361 | 2790 | 2792 |
| Depth in meters | 167 | 310 | 334 | 556 |
| Kind of sediment | mud, sand | mud | mud | mud |
| Gear used | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.7 | 1.44 | 2.33 | 2.77 |
| Wt. of animals, gms. | ← | (not taken) | → | 15.2 |
| **POLYCHAETES** | | | | |
| *Lumbrineris* sp. | 1- | | 1 | |
| *Magelona pacifica* | 1 | | | |
| *Megalomma splendida* | 1 | | | |
| *Myriochele gracilis* | 1 | | | |
| *Nephtys ferruginea* | 10 | | | |
| *Nereis* sp. | 1- | 4 | | |
| *Nothria iridescens* | 1- | | | |
| *Notomastus tenuis* | 6 | 3 | | |
| *Onuphis parva* | 154 | 6 | | |
| *Owenia* sp. | 1- | | | |
| *Paraonis gracilis* | 8 | 9 | | 2 |
| *Pectinaria californiensis* | 26 | 12 | many | |
| *Pholoë glabra* | 14 | 7 | | |

## REDONDO CANYON, BASIN SLOPE *(Continued)*

| | | | | |
|---|---|---|---|---|
| Station number | 2789 | 2361 | 2790 | 2792 |
| Depth in meters | 167 | 310 | 334 | 556 |
| Kind of sediment | mud, sand | mud | mud | mud |
| Gear used | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.7 | 1.44 | 2.33 | 2.77 |
| Wt. of animals, gms. | ← | (not taken) | → | 15.2 |
| **POLYCHAETES** | | | | |
| *Pista* cf *cristata*, sm | 31 | | | |
| ?*Potamethus* sp. | 6 | | | |
| *Praxillella gracilis* | 1 | | | |
| *Praxillella a. pacifica* | 1 | 3 | | |
| *Prionospio cirrifera* | 7 | | | |
| *Prionospio malmgreni* | 10 | 6 | | |
| *Prionospio pinnata* | 15 | 10 | several | |
| *Spiophanes fimbriata* | 5 | 12 jv | | |
| *Sthenelais tertiaglabra* | 1 | | | |
| *Telepsavus costarum* | 1 | | | |
| *Terebellides stroemi* | 2 | | | |
| *Tharyx monilaris* | 2 | 9 | | |
| *Tharyx tesselata* | 6 | 18 | | |

## REDONDO CANYON, BASIN SLOPE *(Continued)*

| | | | | |
|---|---|---|---|---|
| Station number | 2789 | 2361 | 2790 | 2792 |
| Depth in meters | 167 | 310 | 334 | 556 |
| Kind of sediment | mud, sand | mud | mud | mud |
| Gear used | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.7 | 1.44 | 2.33 | 2.77 |
| Wt. of animals, gms. | ← | (not taken) | → | 15.2 |
| **POLYCHAETES** | | | | |
| *Travisia pupa* | 3 | | | |
| *Aricidea uschakowi* | | 2 | | |
| *Brada pilosa* | | 1 | | 36 |
| *Brada pluribranchiata* | | 1 | | |
| ?*Chone* sp. | | 2 | 1 | |
| *Eumida*, 3-lined | | 1 | | |
| *Eunice americana* | | 2 | | |
| *Haploscoplos elongatus* | | 2 | | |
| *Lumbrineris limicola* | | 5 sm | | |
| *Mediomastus californiensis* | | 2 | | |
| *Maldane sarsi* | | 161 lg | many | 4 |
| *Nephtys* spp. | | 10 | | |
| *Nothria pallida* | | 6 | many | 1 |

## REDONDO CANYON, BASIN SLOPE *(Continued)*

| | | | | |
|---|---|---|---|---|
| Station number | 2789 | 2361 | 2790 | 2792 |
| Depth in meters | 167 | 310 | 334 | 556 |
| Kind of sediment | mud, sand | mud | mud | mud |
| Gear used | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.7 | 1.44 | 2.33 | 2.77 |
| Wt. of animals, gms. | (not taken) | (not taken) | (not taken) | 15.2 |
| **POLYCHAETES** | | | | |
| *Pherusa* sp. | | 4 | | |
| *Pilargis maculata* | | 1 | | |
| *Pista disjuncta* | | 7 | | |
| *Polycirrus* sp. | | 4 | | |
| *Travisia* cf. *olens* | | 2 | | |
| *Aglaophamus* sp. | | | 2 | |
| *Anaitides* sp. | | | 3 | |
| cirratulid | | | 1 | |
| *Drilonereis* sp. | | | 1 | |
| harmothoid | | | 1 | |
| *Lumbrineris cruzensis* | | | 1 | |
| maldanid | | | 1 | |
| *Onuphis* sp. | | | 1 | |

## REDONDO CANYON, BASIN SLOPE *(Continued)*

| | | | | |
|---|---|---|---|---|
| Station number | 2789 | 2361 | 2790 | 2792 |
| Depth in meters | 167 | 310 | 334 | 556 |
| Kind of sediment | mud, sand | mud | mud | mud |
| Gear used | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.7 | 1.44 | 2.33 | 2.77 |
| Wt. of animals, gms. | ← | (not taken) | → | 15.2 |
| **POLYCHAETES** | | | | |
| *Prionospio* sp. | | | 2 | |
| terebellid | | | 1 | |
| ampharetids, small | | | | 4 |
| *Califia calida* | | | | 1 lg |
| ?*Euchone* sp. | | | | 1 |
| *Chaetozone* sp. | | | | 9 |
| *Leiochrides hemipodus* | | | | 4 |
| *Melinnexis* sp. | | | | 5 |
| *Myriochele gracilis* | | | | 2 |
| *Oxydromus arenicolus glabrus* | | | | 1 |
| *Pista* sp. | | | | 2 |
| polynoid | | | | 2 |
| *Potamethus mucronatus* | | | | 6 |

## REDONDO CANYON, BASIN SLOPE *(Continued)*

| | | | | |
|---|---|---|---|---|
| Station number | 2789 | 2361 | 2790 | 2792 |
| Depth in meters | 167 | 310 | 334 | 556 |
| Kind of sediment | mud, sand | mud | mud | mud |
| Gear used | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.7 | 1.44 | 2.33 | 2.77 |
| Wt. of animals, gms. | ← | (not taken) | → | 15.2 |
| **POLYCHAETES** | | | | |
| *Prionospio* sp. | | | | 2 |
| *Pherusa neopapillata* | | | | 2 |
| *Polydora* sp. | | | | 1 |
| **ECHINODERMS** | | | | |
| *Amphiodia digitata* | 63 | | | |
| *Amphioplus strongyloplax* | 4 | 4 | | |
| *Amphipholis squamata* | 2 | 7 | | |
| *Brisaster townsendi* | 5 | | present | |
| *Amphiura arcystata* | 1 | | | |
| holothurian | 1 jv | | | |
| *Amphiodia urtica* | | 69 | | |
| *Brissopsis pacifica* | | | present | 2 |
| | | | | |

## REDONDO CANYON, BASIN SLOPE *(Continued)*

| | | | | |
|---|---|---|---|---|
| Station number | 2789 | 2361 | 2790 | 2792 |
| Depth in meters | 167 | 310 | 334 | 556 |
| Kind of sediment | mud, sand | mud | mud | mud |
| Gear used | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.7 | 1.44 | 2.33 | 2.77 |
| Wt. of animals, gms. | ← | (not taken) | → | 15.2 |
| **MOLLUSKS** | | | | |
| *Adontorhina cyclia* | 2 | | | |
| *Balcis rutila* | 2 | | | |
| *Cuspidaria apodema* | 1 | | | |
| *Prochaetoderma* sp. | 1 | | | 1 |
| *Rochefortia* sp. | 2 | | | |
| *Axinopsida serricatus* | | 1 | | |
| solenogasters | | 5 | | |
| *Saxicavella pacifica* | | | 2 | |
| *Admete californica* | | | | 1 |
| *Limifossor fratula* | | | | 1 |
| *Mitrella permodesta* | | | | 6 |
| **CRUSTACEANS** | | | | |
| amphipods | 60 | | 2 | 1 |

## REDONDO CANYON, BASIN SLOPE *(Continued)*

| | | | | |
|---|---|---|---|---|
| Station number | 2789 | 2361 | 2790 | 2792 |
| Depth in meters | 167 | 310 | 334 | 556 |
| Kind of sediment | mud, sand | mud | mud | mud |
| Gear used | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.7 | 1.44 | 2.33 | 2.77 |
| Wt. of animals, gms. | ← | (not taken) | → | 15.2 |
| **CRUSTACEANS** | | | | |
| isopods | | | | |
| anthurid | 5 | | | |
| *Gnathia* sp. | 2 | | | |
| *Ilyarachna* sp. | 3 | | | |
| ostracods | 16 | 13 | present | |
| *Eudorella pacifica* | 18 | | present | |
| **OTHERS** | | | | |
| *Listriolobus pelodes* | 1 lg | | | |
| other echiuroid | | | present | 1 |
| sipunculids | 3 | | | 6 |
| cerianthariar | | 1 | 1 | |
| *Monobrachium* sp. | 10 | 1 | | |
| sea whip | | | | 1 |

## REDONDO CANYON, BASIN SLOPE *(Continued)*

| Station number | 2789 | 2361 | 2790 | 2792 |
|---|---|---|---|---|
| Depth in meters | 167 | 310 | 334 | 556 |
| Kind of sediment | mud, sand | mud | mud | mud |
| Gear used | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.7 | 1.44 | 2.33 | 2.77 |
| Wt. of animals, gms. | ← | (not taken) | → | 15.2 |
| **OTHERS** | | | | |
| nemertean | | | | 3 |

## REDONDO CANYON, BASIN SLOPE *(Continued)*

| | | | | |
|---|---|---|---|---|
| Station number | 2789 | 2361 | 2790 | 2792 |
| Depth in meters | 167 | 310 | 334 | 556 |
| Kind of sediment | mud, sand | mud | mud | mud |
| Gear used | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 1.7 | 1.44 | 2.33 | 2.77 |
| Wt. of animals, gms. | (not taken) | | | 15.2 |
| **NUMBERS OF** | | | | |
| **POLYCHAETES** Species | 40 | 39 | 15+ | 19 |
| Specimens | 387 | 351 | 19+ | 86 |
| **ECHINODERMS** Species | 6 | 3 | 2 | 1 |
| Specimens | 76 | 80 | 2+ | 2 |
| **MOLLUSKS** Species | 5 | 2 | 1 | 4 |
| Specimens | 8 | 6 | 2 | 9 |
| **CRUSTACEANS** Species | 6 | 1 | 3 | 1 |
| Specimens | 104 | 13 | 6+ | 1 |
| **OTHERS** Species | 3 | 2 | 2 | 4 |
| Specimens | 14 | 2 | 2 | 11 |
| **TOTALS** Species | 60 | 47 | 23+ | 29 |
| Specimens | 589 | 452 | 31+ | 109 |

## REDONDO CANYON, BASIN SLOPE *(Continued)*

| Station number . . . . . | 2789 | 2361 | 2790 | 2792 |
|---|---|---|---|---|
| Characteristics of the screenings | gray mud, sand, stones, shelly rubble, many animals, waxy lumps | sandy mud, foraminiferan shells, muddy tubes, many animals | mud with foraminiferan shells, many animals | mud with foraminiferan shells, many animals |
| Largest species | *Travisia pupa* | none | brissopsid | ?*Arhynchite, Melinnexis* |
| Most abundant or conspicuous species | *Onuphis parva, Amphiodia digitata, Chloeia* | *Maldane sarsi, Amphiodia urtica* | *Nothria pallida, Maldane sarsi, Pectinaria* | *Brada pilosa* |

## REDONDO CANYON FAN, to 751 meters

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Station number | 2723 | 2362 | 6774 | 2475 | 3169 | 2476 | 2403 | 2474 |
| Depth in meters | 602 | 652 | 660 | 686 | 706 | 715 | 741 | 751 |
| Kind of sediment | mud | mud | mud | mud | mud | mud, sand | mud | mud |
| Gear used | OPG | OPG | CG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 3.4 | 2.83 | 5.35 | 3.21 | 1.95 | 0.95 | 3.15 | 3.9 |
| Wt. of animals, gms. | (negligible or weights not taken) | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| *Aricidea* spp. | 2 | 3 | | | | | | |
| cirratulids | sev. | | | | | sev. | | |
| *Euclymene* or *Axiothella* sp. | 2 | | | | | | | |
| *Califia calida* | sev. | 1 | 3 lg | 1 | 1 | | ?1 | |
| *Heteromastus filobranchus* | ?1 | | | | | | frg. | |
| *Lumbrineris* spp. | 1 | | 3 | | | sev. | | 1 sm |
| *Oxydromus arenicolus glabrus* | 1 | ?1 | ?4 | | | | | |
| *Paraonis gracilis oculata* | 3 | 7 | | | | 1 | | 4 |
| sabellid | 2 | | | | 2 | | | |
| *Sthenelanella uniformis* | 4 | | | | | | | |
| *Ancistrosyllis tentaculata* | | 1 | | | | | | |
| *Antinoella* sp., blind | | 1 | | | | | | |
| *Cossura candida* | | 4 | 3 | | | | | |

## REDONDO CANYON FAN, to 751 meters *(Continued)*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Station number | 2723 | 2362 | 6774 | 2475 | 3169 | 2476 | 2403 | 2474 |
| Depth in meters | 602 | 652 | 660 | 686 | 706 | 715 | 741 | 751 |
| Kind of sediment | mud | mud | mud | mud | mud | mud, sand | mud | mud |
| Gear used | OPG | OPG | CG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 3.4 | 2.83 | 5.35 | 3.21 | 1.95 | 0.95 | 3.15 | 3.9 |
| Wt. of animals, gms. | (negligible or weights not taken) | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| *Cirratulus* sp. | | 5 | 30 | | | | | |
| *Goniada brunnea* | | 1 | | | | | | |
| *Leiochrides hemipodus* | | 3 | | 1 | | | | ?1 |
| *Lumbrineris cruzensis* | | ?1 | | | | | 2 | |
| *Lysippe annectens* | | 3 | | | | | | 59 |
| *Aricidea uschakowi* | | 3 | | | | | 7 | |
| *Maldane* sp. | | 3 | 2+ | | | | | |
| ?*Nicomache* sp. | | 1 | | | | | | |
| *Pholoë glabra* | | 1- | | | | | | |
| *Phyllochaetopterus limicolus* | | 1- | 2 | 1+ | | 1 lg | 2 | 2 |
| *Polydora* sp. | | 1- | 4 | | | | | |
| *Potamethus mucronatus* | | 5 | | | | | | 1 |
| *Prionospio pinnata* | | 2 | | | | | | |

## REDONDO CANYON FAN, to 751 meters *(Continued)*

| Station number | 2723 | 2362 | 6774 | 2475 | 3169 | 2476 | 2403 | 2474 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 602 | 652 | 660 | 686 | 706 | 715 | 741 | 751 |
| Kind of sediment | mud | mud | mud | mud | mud | mud, sand | mud | mud |
| Gear used | OPG | OPG | CG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 3.4 | 2.83 | 5.35 | 3.21 | 1.95 | 0.95 | 3.15 | 3.9 |
| Wt. of animals, gms. | ← (negligible or weights not taken) → | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| *Praxillella affinis pacifica* | | ?3 | | | | | | |
| *Scalibregma inflatum* | | 1 | | | | | | |
| *Ancistrosyllis breviceps* | | | 2 | 2 | | | | |
| ?*Euchone* sp. | | | 1 | | | | | |
| *Spiophanes anoculata* | | | 1 | | | | | |
| ampharetid | | | | many | ca 20 | many | | |
| *Protis pacifica* or protulid | | | | 1+ | 1+ | | 1+ | 1+ |
| polynoid | | | | 1 | | | | |
| *Laonice* sp. | | | | 1 | | 1 lg | | |
| cirratulid | | | | | 1 | sev. | | |
| ?*Melinnexis* sp. | | | | | 1 | | | |
| maldanid | | | | | | sev. | frg. | |
| *Onuphis* sp. | | | | | | 1 jv | | |

## REDONDO CANYON FAN, to 751 meters *(Continued)*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Station number | 2723 | 2362 | 6774 | 2475 | 3169 | 2476 | 2403 | 2474 |
| Depth in meters | 602 | 652 | 660 | 686 | 706 | 715 | 741 | 751 |
| Kind of sediment | mud | mud | mud | mud | mud | mud, sand | mud | mud |
| Gear used | OPG | OPG | CG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 3.4 | 2.83 | 5.35 | 3.21 | 1.95 | 0.95 | 3.15 | 3.9 |
| Wt. of animals, gms. | (negligible or weights not taken) | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| *Spiophanes* sp. | | | | | | 1 | | |
| *Amphicteis scaphobranchiata* | | | | | | | ca 250 | |
| *Amphicteis* spp. | | | | | | | | |
| *Amphisamytha bioculata* | | | | | | | | |
| *Chaetozone* sp. | | | | | | | 1 | |
| *Euclymene* sp. | | | | | | | 3 | |
| *Glycera c. branchiopoda* | | | | | | | 2 | |
| *Melinna heterodonta* | | | | | | | 1 | |
| *Petaloproctus*, nr *tenuis* | | | | | | | 1 | |
| *Pista alata* | | | | | | | 2 lg | |
| *Spiophanes fimbriata* | | | | | | | 2 | 1 |
| *Ancistrosyllis* sp. | | | | | | | | 1 |
| *Drilonereis* sp. | | | | | | | | 1 |

## REDONDO CANYON FAN, to 751 meters *(Continued)*

| Station number | 2723 | 2362 | 6774 | 2475 | 3169 | 2476 | 2403 | 2474 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 602 | 652 | 660 | 686 | 706 | 715 | 741 | 751 |
| Kind of sediment | mud | mud | mud | mud | mud | mud, sand | mud | mud |
| Gear used | OPG | OPG | CG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 3.4 | 2.83 | 5.35 | 3.21 | 1.95 | 0.95 | 3.15 | 3.9 |
| Wt. of animals, gms. | (negligible or weights not taken) | | | | | | | |
| **ECHINODERMS** | | | | | | | | |
| ophiuroids | 1 | | | | | | | |
| *Asteronyx loveni* | | | 1 | | | | 1 | |
| *Ophiomusium jolliensis* | | | 2 | | 1 lg | | 1 | |
| seastar | | | 1 jv | | | | 1 jv | |
| ?*Leptosynapta* sp. | | | | | | | 1 jv | |
| | | | | | | | | |
| **MOLLUSKS** | | | | | | | | |
| *Limifossor fratula* | 2 | | 3 | | | | | |
| *Crystallophrisson* or solenogaster | 3 | 12 | 3 | 1 | | 1 | 12 | 3 |
| *Prochaetoderma* sp. | | | 2 | | | | | |
| *Mitrella permodesta* | sev. | | | | 1 | 10 | | |
| gastropod, small | sev. | | | | | | | |
| clam, small clay-covered | | 1 | | | 1 | | 5 | 1 |

## REDONDO CANYON FAN, to 751 meters *(Continued)*

| Station number | 2723 | 2362 | 6774 | 2475 | 3169 | 2476 | 2403 | 2474 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 602 | 652 | 660 | 686 | 706 | 715 | 741 | 751 |
| Kind of sediment | mud | mud | mud | mud | mud | mud, sand | mud | mud |
| Gear used | OPG | OPG | CG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 3.4 | 2.83 | 5.35 | 3.21 | 1.95 | 0.95 | 3.15 | 3.9 |
| Wt. of animals, gms. | ← (negligible or weights not taken) → | | | | | | | |
| **MOLLUSKS** | | | | | | | | |
| scaphopod | | 1 | | | | | | |
| *Cadulus tolmiei* | | | 2 | | 9 | | | |
| *Amygdalum pallidulum* | | | 1 | | | | | |
| *Dermatomya tenuiconcha* | | | | 1 | | | | |
| *Tindaria californica* | | | | 1 | | | | |
| **CRUSTACEANS** | | | | | | | | |
| amphipod | | | | 2 | | | | |
| **OTHERS** | | | | | | | | |
| sea pen | 1 | 1 sm | 5 | 1 | 1 sm | 1 | 2 | |
| anemone | 2 | 1 | 1 | 3 | | 2 | | |
| nemerteans | 3 | 7 | 3 | | 1 sm | 1 | 6 | 1 |
| echiuroid | | 1 lg | 3 | 1 | | | | |
| sipunculids | | 6 | 12 | | | | 2 | |

## REDONDO CANYON FAN, to 751 meters *(Continued)*

| Station number | 2723 | 2362 | 6774 | 2475 | 3169 | 2476 | 2403 | 2474 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 602 | 652 | 660 | 686 | 706 | 715 | 741 | 751 |
| Kind of sediment | mud | mud | mud | mud | mud | mud, sand | mud | mud |
| Gear used | OPG | OPG | CG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 3.4 | 2.83 | 5.35 | 3.21 | 1.95 | 0.95 | 3.15 | 3.9 |
| Wt. of animals, gms. | (weights not taken) | | | | | | | |
| **OTHERS** | | | | | | | | |
| enteropneust | | 8 | 4 | | | 3 | 3 | |
| *Glottidia albida* | | | | | | | 2 | |

## REDONDO CANYON FAN, to 751 meters *(Continued)*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Station number | 2723 | 2362 | 6774 | 2475 | 3169 | 2476 | 2403 | 2474 |
| Depth in meters | 602 | 652 | 660 | 686 | 706 | 715 | 741 | 751 |
| Kind of sediment | mud | mud | mud | mud | mud | mud, sand | mud | mud |
| Gear used | OPG | OPG | CG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 3.4 | 2.83 | 5.35 | 3.21 | 1.95 | 0.95 | 3.15 | 3.9 |
| Wt. of animals, gms. | (negligible or weights not taken) | | | | | | | |
| **NUMBERS OF** | | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| Species | 10 | 22 | 11 | 8 | 6 | 10 | 14 | 10 |
| Specimens | 16+ | 52 | 55 | 8+ | 24 | 18+ | 275 | 72 |
| **ECHINODERMS** | | | | | | | | |
| Species | 1 | 0 | 3 | 0 | 1 | 0 | 4 | 0 |
| Specimens | 1 | 0 | 4 | 0 | 1 | 0 | 4 | 0 |
| **MOLLUSKS** | | | | | | | | |
| Species | 4 | 2 | 3 | 5 | 2 | 3 | 2 | 2 |
| Specimens | 7+ | 13 | 6 | 6 | 2 | 20 | 17 | 4 |
| **CRUSTACEANS** | | | | | | | | |
| Species | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Specimens | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| **OTHERS** | | | | | | | | |
| Species | 3 | 6 | 6 | 3 | 2 | 4 | 4 | 2 |
| Specimens | 6 | 24 | 28 | 5 | 2 | 7 | 13 | 3 |
| **TOTALS** | | | | | | | | |
| Species | 18 | 30 | 23 | 17 | 11 | 17 | 24 | 14 |
| Specimens | 30+ | 89 | 93 | 21+ | 29 | 45+ | 309 | 79 |

## REDONDO CANYON FAN, to 751 meters *(Continued)*

| Station number . . . . . | 2723 | 2362 | 6774 | 2475 | 3169 | 2476 | 2403 | 2474 |
|---|---|---|---|---|---|---|---|---|
| Characteristics of the screenings | muddy tubes, wormlike animals, foraminiferan tests | arenaceous and calcareous foraminiferan tests, many animals | sticky green mud with wormlike animals | siliceous sponge, foraminiferan tests, mud with animals | foraminiferan tests, animals in silt | black mud, woody debris, animals | foraminiferan tests, waxy and cindery lumps, animals | foraminiferan tests, wormlike animals |
| Largest species | none | echiuroid, sipunculid | sea whip, echiuroid | none | *Ophiomusium* | ?*Schizocardium* | *Pista alata* | *Potamethus* |
| Most conspicuous or abundant species | enteropneust | enteropneust | *Cirratulus* | none | ampharetid | *Mitrella permodesta*, *Cadulus tolmiei* | ampharetids | *Lysippe annectens* |

## REDONDO CANYON FAN, 769 to 800 meters

| Station number | 2791 | 2620 | 6775 | 2363 | 2794 | 2619 |
|---|---|---|---|---|---|---|
| Depth in meters | 769 | 774 | 786 | 794 | 796 | 800 |
| Kind of sediment | | | | | | |
| Gear used | OPG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 3.08 | 2.2 | 5.45 | 2.77 | 3.4 | 3.15 |
| Wt. of animals, gms. | ← (negligible, or weights not taken) → | | | | | |
| **POLYCHAETES** | | | | | | |
| *Phyllochaetopterus limicolus* | | tubes | 1 and tubes | | tubes | tubes |
| *Protis pacifica* | | tubes | tubes | | | |
| *Ancistrosyllis breviceps* | | | 2 | | | |
| *Antinoella* sp. | | | 1- | | | |
| *Califia calida* | | | 1 | | | |
| *Lysippe* sp. | | | 4 sm | | | |
| ?*Drilonereis* sp., very slender | | | | | | 1 |
| *Lumbrineris* sp., dark purple | | | | | | 1 |
| onuphid | | | | | | tube |
| **MOLLUSKS** | | | | | | |
| solenogasters | 2 | | 1 lg | | | |
| **OTHERS** | | | | | | |
| sea whip | | | 1 sm | | | |

## REDONDO CANYON FAN, 769 to 800 meters *(Continued)*

| Station number | 2791 | 2620 | 6775 | 2363 | 2794 | 2619 |
|---|---|---|---|---|---|---|
| Depth in meters | 769 | 774 | 786 | 794 | 796 | 800 |
| Kind of sediment | | | | | | |
| Gear used | OPG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 3.08 | 2.2 | 5.45 | 2.77 | 3.4 | 3.15 |
| Wt. of animals, gms. | (negligible, or weights not taken) | | | | | |
| **OTHERS** | | | | | | |
| siliceous sponge | | | present | | present | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

## REDONDO CANYON FAN, 769 to 800 meters *(Continued)*

| | | | | | | |
|---|---|---|---|---|---|---|
| Station number | 2791 | 2620 | 6775 | 2363 | 2794 | 2619 |
| Depth in meters | 769 | 774 | 786 | 794 | 796 | 800 |
| Kind of sediment | | | | | | |
| Gear used | OPG | OPG | CG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 3.08 | 2.2 | 5.45 | 2.77 | 3.4 | 3.15 |
| Wt. of animals, gms. | (negligible, or weights not taken) | | | | | |
| **NUMBERS OF** | | | | | | |
| **POLYCHAETES** Species | 0 | tubes | 4 | 0 | tubes | 2 |
| Specimens | 0 | | 7+ tubes | 0 | | 2+ tubes |
| **ECHINODERMS** Species | 0 | 0 | 0 | 0 | 0 | 0 |
| Specimens | 0 | 0 | 0 | 0 | 0 | 0 |
| **MOLLUSKS** Species | 1 | 0 | 1 | 0 | 0 | 0 |
| Specimens | 2 | 0 | 1 | 0 | 0 | 0 |
| **CRUSTACEANS** Species | 0 | 0 | 0 | 0 | 0 | 0 |
| Specimens | 0 | 0 | 0 | 0 | 0 | 0 |
| **OTHERS** Species | 0 | 0 | 2 | 0 | 1 | 0 |
| Specimens | 0 | 0 | 2 | 0 | 1 | 0 |
| **TOTALS** Species | 1 | | 7 | 0 | 1 | 2 |
| Specimens | 2 | tubes | 10+ tubes | 0 | 1+ tubes | 2+ tubes |

## REDONDO CANYON FAN, 769 to 800 meters *(Continued)*

| Station number . . . . . | 2791 | 2620 | 6775 | 2363 | 2794 | 2619 |
|---|---|---|---|---|---|---|
| Characteristics of the screenings | blue-gray mud, foram. tests, dead tubes | tubes of *Protis* & *Phyllochaetopterus* | sticky green mud, cindery stones, foram. tests | tubes of *Phyllochaetopterus*, foram. tests | Blue-gray mud, forams., *Phyllochaetopterus* tubes | gray green mud, forams., *Phyllochaetopterus* tubes |
| Largest species | none | none | *Califia calida* | none | none | none |
| Most conspicuous or abundant species | none | none | none | none | none | none |

## REDONDO CANYON FAN, 808 to 853 meters

| Station number | 2419 | 2404 | 2729 | 2432 | 2405 | 2420 | 2322 |
|---|---|---|---|---|---|---|---|
| Depth in meters | 808 | 810 | 825 | 834 | 846 | 848 | 853 |
| Kind of sediment | | | | | | | |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 3.71 | 1.07 | 3.40 | 3.59 | 2.26 | 3.15 | 2.77 |
| Wt. of animals, gms. | ← (negligible, or weights not taken) → | | | | | | |
| **POLYCHAETES** | | | | | | | |
| *Amphicteis scaphobranchiata* | | several | | | | | |
| *Aricidea* spp. | | many | | | | | |
| cirratulid | | 4 | | | | | |
| *Lagisca* sp. | | 1 | | | | | |
| *Polydora* sp. | | 1 | | | | | |
| terebellid | | 1 | | | | | |
| *Amage* sp. | | | 7 | | | | |
| *Glycera capitata branchiopoda* | | | 1 | | | | |
| *Spiophanes* sp. | | | 1 | | | | |
| **ECHINODERMS** | | | | | | | |
| *Brisaster townsendi* | 1 lg | | | | | | |
| *Brissopsis pacifica* | 1 sm | | | | | | |
| | | | | | | | |

## REDONDO CANYON FAN, 808 to 853 meters (Continued)

| Station number | 2419 | 2404 | 2729 | 2432 | 2405 | 2420 | 2322 |
|---|---|---|---|---|---|---|---|
| Depth in meters | 808 | 810 | 825 | 834 | 846 | 848 | 853 |
| Kind of sediment | | | | | | | |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 3.71 | 1.07 | 3.40 | 3.59 | 2.26 | 3.15 | 2.77 |
| Wt. of animals, gms. | (negligible, or weights not taken) | | | | | | |
| **MOLLUSKS** | | | | | | | |
| *Mitrella permodesta* | 5 | | | | | | |
| *Limifossor fratula* | | 1 | 1 | | | | |
| scaphopod | | 1 | | | | | |
| **OTHERS** | | | | | | | |
| sipunculid | | | 1 | | | | |

## REDONDO CANYON FAN, 808 to 853 meters *(Continued)*

| Station number | 2419 | 2404 | 2729 | 2432 | 2405 | 2420 | 2322 |
|---|---|---|---|---|---|---|---|
| Depth in meters | 808 | 810 | 825 | 834 | 846 | 848 | 853 |
| Kind of sediment | | | | | | | |
| Gear used | OPG | OPG | OPG | OPG | OPG | OPG | OPG |
| Vol. of sample, cu. ft. | 3.71 | 1.07 | 3.40 | 3.59 | 2.26 | 3.15 | 2.77 |
| Wt. of animals, gms. | (negligible, or weights not taken) | | | | | | |
| **NUMBERS OF POLYCHAETES** | | | | | | | |
| Species | 0 | 6 | 3 | 0 | 0 | 0 | 0 |
| Specimens | 0 | 9+ | 9 | 9 | 0 | 0 | 0 |
| **ECHINODERMS** | | | | | | | |
| Species | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Specimens | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| **MOLLUSKS** | | | | | | | |
| Species | 1 | 2 | 1 | 0 | 0 | 0 | 0 |
| Specimens | 5 | 2 | 1 | 0 | 0 | 0 | 0 |
| **CRUSTACEANS** | | | | | | | |
| Species | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Specimens | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **OTHERS** | | | | | | | |
| Species | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Specimens | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| **TOTALS** | | | | | | | |
| Species | 3 | 8 | 5 | 0 | 0 | 0 | 0 |
| Specimens | 7 | 11+ | 11 | 0 | 0 | 0 | 0 |

## REDONDO CANYON FAN, 808 to 853 meters *(Continued)*

| Station number - - - - - | 2419 | 2404 | 2729 | 2432 | 2405 | 2420 | 2322 |
|---|---|---|---|---|---|---|---|
| Characteristics of the screenings | silty mud, forams., *Phyllochaetopterus* tubes | plant and woody debris, sandy mud, worms | green mud, forams., worms, siliceous sponge | silty mud, forams., *Phyllochaetopterus* & *Protis* tubes | sandy mud, forams., *Phyllochaetopterus* tubes | green mud, forams., *Phyllochaetopterus* & *Protis* tubes | mud, forams., *Phyllochaetopterus* & *Protis* tubes |
| Largest species | *Brisaster townsendi* | none | none | none | none | none | none |
| Most conspicuous or abundant species | *Mitrella permodesta* | none | *Phyllochaetopterus limicolus* | none | none | none | none |

## SAN PEDRO SEA VALLEY

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ........ | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | >14.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Aricidea pacifica* | 1 | | | | | | | | | | | | | | |
| *Chaetozone ?setosa* | 2 | | | | 1 | | | | | | | | | | |
| *Chaetozone armata* | 1 | | | | | | | | | | 1 | | | | |
| *Chloeia pinnata* | 50+ | 1 | 410 | many | | 27 jv | 11 | 35 lg | 117 | 2 | 1 | | | | |
| *Cossura candida* or sp. | 1 | 13 | | | | | | | | | 1 | | | | |
| *Diopatra ornata* or sp. | 3 jv | 3 | 1 jv | | | | | | | | | | | | |
| *Dorvillea articulata* | 5 | 2 | 3 | 12 | 1 | | | | | | | | | | |
| *Drilonereis ?nuda* | 4 | | | | | | | | | | | | | | |
| *Eunice americana* | 1 | | 1 frg | 1 | | | | | | | | | | | |
| *Genetyllis castanea* | 4 | | | | | | | | | | | | | | |
| *Glycera americana* | 5 | 2 lg | | 1 lg | 1 sm | | | | | | | | | | |
| *Goniada brunnea* | 44 | 9 | 8 | 5+ | 1 | 1 | | | | | | | | | |
| *Haploscoloplos elongatus* | 3 | | 2 | | | | | | 1 | | | | | | |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ...... | 70.7 | ...... | ...... | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | 14.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Hypoeulalia bilineata* | 7 | | | | | | | | | | | | | | |
| *Isocirrus* sp. | 1- | | | | | | | | | | | | | | |
| *Laonice* sp. | 2 | 3 frg | | | | | | | | | | | | | |
| *Lumbrineris cruzensis* | 1 | | 5 | | | | | | | | 2 | | | | |
| *Lumbrineris index* | 10 lg | 12 lg | 2 | | 2 lg | 2 lg | 1 | | | | | | | | |
| *Lumbrineris latreilli* | 15+ | | | | | | | | | | | | | | |
| *Lysippe annectens* | ca 15 | | | | | | | | | | 33 | 37 | 6 | 1 | |
| *Maldane sarsi* | many | 1 | 3 | | | 1 | 14 | 2 | 322 | 14 | 1 jv | | 1 | | |
| *Marphysa bellii oculata* | 15 | | | 2 | | | | | | | | | | | |
| *Myxicola infundibulum* | 1 | | | | | | | | | | | | | | |
| *Nereis procera* | many | ?1 | | | | | | | | | | | | | |
| *Nephtys ferruginea* | 5 | 2 jv | 16 | sev. | 7 sm | | | | | | | | | | |
| *Nephtys glabra* | 2 lg | | | | | | | | | | | | | | |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ........ | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | 14.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Nicomache ?personata* | 1- | | | | | | | | | | | | | | |
| *Nothria iridescens* | 43+ | | 1 | | | | | | ?3 lg | | | | | | |
| *Notomastus tenuis* | 4 | ?17 | | | | | | | | | | | | | |
| *Notomastus magnus* | 2 | | | | | | | | | | | | | | |
| *Ophiodromus pugettensis* | 4 | | | | | | | | | | | | | | |
| *Paraonis gracilis* | 1 | | | | 3 | | 1 | | 1 | 1 | 1 | 1 | | | 1 |
| *Pectinaria californiensis* | 10 | 14 | 70 | few | 24 sm | 20+ | 1 | 2 sm | 17 lg | 7 | | | | | |
| *Pherusa capulata* | 6 lg | | 2 | | | 1 | | | | | | | | | |
| *Pherusa neopapillata* | 5 | | 2 | | 1 jv | | | | | | | | | | |
| *Pilargis berkeleyi* | 1 | | | | | | | | | | | | | | |
| *Pista disjuncta* | 1 | | 1 | | | | 7 lg | 17 | | | | | | | |
| *Praxillella affinis pacifica* | 2 | 3 lg | | | | | | | | | | | | | 2 frg |
| *Praxillella gracilis* | 1- | | 2 lg | | | | | | | | | | | | |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ........ | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | >14.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Prionospio malmgreni* | 2 | 1 | | | | | | | | 5 jv | | | | | |
| *Prionospio pinnata* | 1 | 13 | 47 | 2 sm | 5 | | 7 sm | | | | 5 | | | | |
| *Schistocomus* sp. | 2 | | | | | | | | | | | | | | |
| *Spiophanes fimbriata* | 7 | 1 | 127 | | | | | | | | 1 frg | | | 3 | |
| *Sternaspis fossor* | 9 | | 3 lg | | | | | | | | | | | | |
| *Sthenelanella uniformis* | 50+ | | | | | | | | | | | | | | |
| *Thalenessa spinosa* | 4 | | | | | | | | | | | | | | |
| *Tharyx tesselata* | 3 | 5 lg | 2 | | | | | | | | | | | | |
| *Travisia pupa* | 4 lg | | | | | | | | | | | | | | |
| *Ancistrosyllis tentaculata* | | 17 | | | | | | | | | | | | | |
| *Asychis disparidentata* | | 1 lg | 1 | | | | 1 | | | | 1 | 1 | | | |
| *Eumida*, longitud. striped | | 1 jv | | | | | | 1 | | | | | | | |
| *Glycera capitata* | | 13 | 4 | 17 sm | 1 | ?2 | | | | | | | | | |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ........ | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | >14.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Lepidasthenia* sp. | | 4 | | | | | | | | | | | | | |
| *Lumbrineris bicirrata* | | 5 | | | 1 sm | | | | | | | | | | |
| *Marphysa conferta* | | 1 jv | | | | | | | | | | | | | |
| *Nephtys* spp. | | 1 jv | | | | | | | | | | | | | |
| *Ninoë gemmea* | | 3 | | | | | | | | | | | | | |
| *Onuphis parva* | | 1 | | | | | | | | | | | | | |
| *Panthalis pacifica* | | 2 | | | | | | | | | | | | | |
| *Pilargis maculata* | | 4 | 1 frg | | 1 | 1 | | | | | | 1 | | | |
| *Pholoë glabra* | | 3 jv | 13 | | | | | | | | | | | | |
| *Spiophanes missionensis* | | 46 | | | | | | 1 | | | | | | | |
| *Terebellides stroemi* | | 1 | 1 | | | | | 1 | | | | | | | |
| *Tharyx monilaris* | | | ?2 | 2 | | 2 | | | | | | 1 | | | |
| *Amage* sp. | | | 2 | | | | | | | | | | | | |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ........ | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | >14.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Amphicteis ?mucronata* | | | 7 | | | | | | | | | | | | |
| *Anaitides* sp. | | | 1 | | | 1 | | | | | | | | | |
| *Axiothella* sp. | | | 1 | | | | | | | | | | | | |
| *Brada pluribranchiata* | | | 1 | | 1 | | | | | | | | | | |
| *Eteone ?californica* | | | 1 | | | | | | | | | | | | |
| *?Euchone* sp. | | | 1 | | | | | | | | | | | | |
| *Glycera ?robusta* | | | 1 frg | | | | | | | | | | | | |
| *Harmothoë* sp., reticulate | | | 5 | | | | | | | | | | | | |
| *Laonice foliata* | | | 1 | | ?1 frg | | | | | | | | | | |
| *Lumbrineris californiensis* | | | 18 | | | | | | | | | | | | |
| *Marphysa disjuncta* | | | 7 | | | | | | | | | | | | |
| *Megalomma*, bioculate | | | 1 | | | | | | | | | | | | |
| *Myriochele gracilis* | | | 1763 | | | | | | 1 | | | | | | 2 |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ...... | 70.7 | ...... | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | >14.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Nephtys assignis* | | | 1 | | | | | | | | | | | | |
| *Nereis*, unknown sp. | | | 8 | | | | | | | | | | | | |
| *Notomastus* sp. | | | 4 frg | | | | | | | | | | | | |
| *Phyllochaetopterus limicolus* | | | 1 | | | | | | | | | | | | 2 |
| *Poecilochaetus johnsoni* | | | 1 | | | | | | | | | | | | |
| *Rhodine bitorquata* | | | 1 | | | | | | | | | | | | |
| *Syllis* sp. | | | 1 | | | | | | | | | | | | |
| *Ammotrypane aulogaster* | | | | 15 | | | | 1 | | | | | | | |
| *Anaitides multiseriata* | | | | 7 | | | | | | | | | | | |
| *Anaitides*, other sp. | | | | 4 | | | | | | | | | | | |
| *Lumbrineris* spp. | | | | many | | | | | | | | | | | |
| *Odontosyllis phosphorea* | | | | 4 | | | | | | | | | | | |
| *Onuphis nebulosa* | | | | sev. | 1 sm | | | | | | | | | | |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ........ | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | >14.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Prionospio* spp. | | | | sev. | | | | | | 3 | | | | | |
| *Sphaerodoridium ?sphaerulifer* | | | | 5 | | | | | | | | | | | |
| *Spiophanes* sp. | | | | sev. | | | | | | | | | | | |
| *Sthenelais verruculosa* | | | | 1 | | | | | | | | | | | |
| *Aglaophamus erectans* | | | | | 1 | | | | | | | | | | |
| *Harmothoë*, nr *lunulata* | | | | | 3 | | | | | | | | | | |
| *Heteromastus filobranchus* | | | | | 1 | 14 | 1 | | | | | | | | |
| *Oxydromus a. glabrus* | | | | | 1 frg | | | | | | 1 | 4 frg | | | 3 |
| *Glycinde* sp. | | | | | | 3 | | | | | | | | | |
| nephtyid, white | | | | | | 12 sm | | | | | | | | | |
| polynoid | | | | | | 1 sm | | | | | | | | | |
| *Onuphis vexillaria* | | | | | | | ?1 lg | 1+ | | 1 lg | | | | | |
| *Califia calida* | | | | | | | 1 lg | 1 | | | 2 lg | | 1 | 1 lg | 2 |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | .740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ........ | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | 14.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Brada pilosa* | | | | | | | | 17 | | 4 | 7 | | | | |
| *Ampharete* sp. | | | | | | | | 2 | | | | | | | |
| *Amphiduros,* nr *pacificus* | | | | | | | | 1 | | | | | | | |
| *Aphrodita japonica* | | | | | | | | ?1 | | | | | | | |
| *Asychis* sp. | | | | | | | | 1 | | | | | | | |
| *Ancistrosyllis breviceps* | | | | | | | | 1 | | | | | | 1 | |
| *Leiochrides hemipodus* | | | | | | | | 3 | | | | 2 | ?7 | 1 | 2 |
| *Melinna heterodonta* | | | | | | | | 2 | | | 1 lg | 1 lg | | | |
| *Nothria pallida* | | | | | | | | 2 | | | 1 | | | | |
| *Peisidice aspera* | | | | | | | | 1 | | | | | | | |
| *Pista ?fasciata* | | | | | | | | 6 | | | | | | | |
| *Protis pacifica* | | | | | | | | 2 | 2 | | | | 1 | | 10+ |
| *Aricidea uschakowi* | | | | | | | | | 1 lg | | | | | | |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ........ | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | >14.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Lagisca* sp. | | | | | | | | | 1 frg | | | | | | |
| *Melinnexis moorei* | | | | | | | | | 1 | | | | | | |
| nephtyid | | | | | | | | | 1 jv | | | | | | |
| *Pherusa* sp. | | | | | | | | | 2 lg | | | | | | |
| *Spiophanes pallidus* or sp. | | | | | | | | | 1 | | | | | | |
| *Aglaophamus dicirris* | | | | | | | | | | 3 | | | | | |
| *Antinoella* sp. | | | | | | | | | | 5 | | | | | |
| *Glycera capitata branchiopoda* | | | | | | | | | | 1 | | | | 1 | |
| maldanids | | | | | | | | | | 1 frg | | | 3 frg | 2 | |
| *Prionospio* sp. | | | | | | | | | | 3 | | | | | |
| *Tharyx* sp. | | | | | | | | | | 1 jv | | | | 1 frg | |
| ?*Nicomache lumbricalis* | | | | | | | | | | | 1 | | | | |
| *Amage anops* | | | | | | | | | | | 4 | | | | |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ........ | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | >14.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Chone* sp. | | | | | | | | | | | 1 | | | | |
| *Aricidea lopezi* | | | | | | | | | | | | 2 | 2 | | |
| *Amphicteis* sp. | | | | | | | | | | | | 1 | | | |
| *Scalibregma* sp. | | | | | | | | | | | | 1 frg | | | |
| hesionid, small white | | | | | | | | | | | | | | 2 | |
| *Prionospio ?cirrifera* | | | | | | | | | | | | | | 1 | |
| *Pista* sp. | | | | | | | | | | | | | | 1 | |
| *Ancistrosyllis*, nr *groenlandica* | | | | | | | | | | | | | | | 1 |
| *Ceratocephala crosslandi americana* | | | | | | | | | | | | | | | 3 |
| *Aricidea lopezi rubra* | | | | | | | | | | | | | | | 5 |
| *Anobothrus ?gracilis* | | | | | | | | | | | | | | | 2 |
| *Lumbrineris longensis* | | | | | | | | | | | | | | | 1 |
| *Potamethus mucronatus* | | | | | | | | | | | | | | | 5 |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ........ | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | >14.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | |
| *Spiophanes* sp. | | | | | | | | | | | | | | | 4 |
| **ECHINODERMS** | | | | | | | | | | | | | | | |
| *Amphipholis squamata* | | 4 | 8 | 2 | | | | | | | | | | | |
| *Amphiura arcystata* | | | 3 | | | | | | | | | | | | |
| *Amphiacantha amphacantha* | | | 1 | | | | | | | | | | | | |
| *Amphiodia urtica* | | | 27 | 25 | | | | | | | | | | | |
| *Amphiodia digitata* | | | 3 | | | | | | | | | | | | |
| *Amphioplus hexacanthus* | | | 3 | | | | | | | | | | | | |
| *Amphioplus strongyloplax* | | | 4 | | | | | | | | | | | | |
| *Brisaster townsendi* | | | 3 | 17 | 4 | | 2 | | 1 | 1 | 1 | | | | 1 |
| *Pentamera pseudopopulifera* | | | 1 | 2 | | | | | | | | 1 | | | |
| *Leptosynapta albicans* | | | 30 | | | | | | 1 sm | | | 1 | | | |
| *Amphichondrius laevis* | | | | 1 | | | | | | | | | | | |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ........ | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | 14.0 |
| **ECHINODERMS** | | | | | | | | | | | | | | | |
| *Luidia foliolata* | | | | 1 jv | | | | | | | | | | | |
| *Brissopsis pacifica* | | | | 10 | | | 1 | | 3 | | | 1 | | | 1 |
| *Allocentrotus fragilis* | | | | | 1 | | | | | | | | | | |
| *Amphipholis pugetana* | | | | | | | | | 1 sm | | | | 2 | | |
| *Asteronyx loveni* | | | | | | | | | | | | | | 1 | |
| *Ophiocynodes corynetes* | | | | | | | | | | | | | | 1 | |
| **MOLLUSKS** | | | | | | | | | | | | | | | |
| *Amygdalum pallidulum* | | 1 | 1 | sev. | | | | | | | | | | | |
| *Axinopsida serricatus* | | many | | pres. | | | | | | | | | | | |
| *Acteon* sp. | | 1 | | | | | | | | | | | | | |
| *Cyathodonta* sp. | | 1 | | | | | | | | | | | | | |
| *Cadulus* sp. | | p | | | | 1 | | | 4 | | | | | | |
| *Dentalium rectius* | | 150 tubes | | | | | | | 1 | | | | | | |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ........ | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | 14.0 |
| **MOLLUSKS** | | | | | | | | | | | | | | | |
| *Nuculana* sp. | | 1 | | | | | | | | | | | | | |
| Solenogasters | | | 17 | | 1 | 1 | 2 | 2+ | 7 | | | | 9 sm | 1 | 10 |
| ?*Macoma* sp. | | | 1 | | | | | | | | | | | | |
| *Limatula* sp. | | | 1 | | | | | | | | | | | | |
| *Compsomyax* sp. | | | 1 | | | | | | | | | | | | |
| *Aglaja* sp. | | | 1 | | | | | | | | | | | | |
| scaphopods | | | 2 | | | | | | | | | | | | |
| slug, post. incised | | | 1 | | | | | | | | | | | | |
| *Tellina carpenteri* | | | | pres. | | | | | | | | | | | |
| *Cardita ventricosa* | | | | | 1 | | | | 1 | | | | | | |
| *Saxicavella pacifica* | | | | | 21 | | 1 | | 21 | 6 | | | | | |
| *Solemya* sp. | | | | | 1 | | | | | | | | | | |
| *Eulima* sp. | | | | | ca 10 | | | | | | | | | | |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ........ | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | >14.0 |
| **MOLLUSKS** | | | | | | | | | | | | | | | |
| *Prochaetoderma* sp. | | | | | 1 | | | | | | 1 | | | | 1 |
| *Yoldia* sp. | | | | | | 1 | | | | | | | | | |
| *Amphissa bicolor* | | | | | | 1 | 1 | | | 6 | | | | | |
| *Bittium* sp. | | | | | | | 1 | | | | | | | | |
| *Rochefortia* sp. | | | | | | | 2 | | | | | | | | |
| *Mitrella permodesta* | | | | | | | 1 | | | | | 5 | 1 | 2 | dd |
| **CRUSTACEANS** | | | | | | | | | | | | | | | |
| amphipods | | | 6 | 2 | | | 6 | | | 3 | 1 | | | | |
| isopods | | | | | | | | | | | | | | | |
| *Gnathia* sp. | | 1 | 1 | | | | | | | | | | | | |
| *Ilyarachna* sp. | | | | | | | | | 2 | | | | | | |
| anthurid | | | 2 | | | | | | | | | | | | |
| apseudid | | | | | | | | | | | | | | | 2 |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ....... | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | >14.0 |
| **CRUSTACEANS** | | | | | | | | | | | | | | | |
| tanaid | | | 1 | | | | | | | | | | | | |
| caprellid | | 1 | 3 | | | | | | | | | | | | |
| cumaceans | | | | | | | | | | | | | | | |
| *Diastylis pellucida* | | 2 | 2 | | | | | | | | | | | | |
| *Campylaspis* sp. | | | 2 | | | | | | | | | | | | |
| macruran crab | | | | | | | | 1 | | | | | | | |
| ghost shrimp | | | | | | | | | | | | 1 | 1 | | |
| **OTHERS** | | | | | | | | | | | | | | | |
| nemerteans | | 2 lg | 2 | | | 2 | | 1 frg | | | | | | | |
| *Cerebratulus* sp. | | | | | 3 | | | | 3 | 1 frg | 1 | | 4 | 1 frg | 2 |
| polyclad | | 1 sm | 3 | | | | | | | | 4 | 6 | | | |
| *Golfingia macginitiei* | | ?1 lg | | | | | | | | | | | | | |
| *Monobrachium* sp., colony | | | 1 sm | | | | | | | | | | | | |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ....... | 70.7 | ....... | ....... | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | 14.0 |
| **OTHERS** | | | | | | | | | | | | | | | |
| flat-fish | | | 1 sm | | | | | | | | | | | | |
| *Arhynchite* sp. | | | | | 2 lg | | 2 | | | | | | | | |
| sea whip | | | | | | | | | | 1 | | | | | ?1 frg |
| echiuroid, coarsely papillate | | | | | | | | | | 2 | | | | | |
| echiuroid, smooth surface | | | | | | | | | | 9 | | | | | |
| echiuroid, translucent | | | | | | | | | | | 1 | | | | |
| ?oligochaete | | | | | | | | | | 1 | | | | | |
| ceriantharian | | | | | | | | | | | | 1 | | | |
| enteropneust | | | | | | | | | | | 1 lg | 1 | 1 frg | | 3 |
| sipunculids | | | | | | | | | | | | | 1 | ?1 | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | 7175 | 6854 | 7174 | 7161 | 6501 | 7160 | 2219 | 2218 | 5639 | 7155 | 2317 | 6503 | 2336 | 6861 | 7498 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 200-572 | 187 | 221 | 240-280 | 319 | 406 | 437 | 459 | 461 | 468 | 522 | 661 | 666 | 716 | 740 |
| Kind of sediment | mud | mud | mud | silt | mud | sand, mud | mud | mud | mud | mud | mud | mud | mud | mud | mud |
| Gear used | dredge | CG | CG | dredge | CG | CG | OPG | OPG | OPG | CG | OPG | CG | OPG | CG | CG |
| Vol. of sample, cu. ft. | 4.5 | 5.74 | 5.7 | 4.0 | 4.3 | 4.8 | 2.96 | 2.83 | 0.7 | 1.43 | 2.83 | 5.0 | 2.83 | 5.74 | 3.22 |
| Wt. of animals, gms. | ........ | 70.7 | ........ | ........ | 97.0 | 13.7 | 58.7 | 46.3 | 39.0 | 57.0 | 51.5 | 3.9 | 5.0 | ca 4.0 | >14.0 |
| **NUMBERS OF POLYCHAETES** Species | 48 | 33 | 48 | 21+ | 21 | 14 | 11 | 21 | 14 | 14 | 17 | 11 | 7 | 11 | 14 |
| Specimens | 361+ | 206 | 2558 | many | 59 | 88 | 46 | 101 | 471 | 51 | 65 | 52 | 21 | 15 | 45 |
| **ECHINODERMS** Species | 0 | 1 | 10 | 7 | 2 | 0 | 2 | 0 | 4 | 1 | 1 | 2 | 1 | 2 | 1 |
| Specimens | 0 | 4 | 53 | | 5 | 0 | 3 | 0 | 6 | 2 | 2 | 2 | 2 | 2 | 1 |
| **MOLLUSKS** Species | 1 | 7 | 8 | | 6 | 4 | 6 | 1 | 5 | 3 | 1 | 1 | 2 | 2 | 2 |
| Specimens | few | many | 25 | | 35 | 4 | 8 | 2+ | 34 | 14 | 1 | 5 | 10 | 3 | 11 |
| **CRUSTACEANS** Species | 1 | 3 | 7 | | 1 | 0 | 1 | 1 | 1+ | 1 | 1 | 1 | 2 | 0 | 1 |
| Specimens | 1 | 4 | 17 | | 2 | 0 | 6 | 1 | 16 | 3 | 1 | 1 | 2 | 0 | 2 |
| **OTHERS** Species | | 3 | 4 | | 2 | 1 | 1 | 1 | 1 | 5 | 4 | 3 | 3 | 2 | 3 |
| Specimens | | 4 | 7 | | 5 | 2 | 2 | 1 | 3 | 14 | 7 | 8 | 6 | 2 | 6 |
| **TOTALS** Species | 50+ | 47 | 77 | inc | 32 | 19 | 21 | 24 | 25+ | 24 | 24 | 18 | 15 | 17 | 21 |
| Specimens | 362+ | 218+ | 2660 | | 106 | 94 | 65 | 105+ | 530 | 84 | 76 | 68 | 41 | 22 | 65 |

## SAN PEDRO SEA VALLEY *(Continued)*

| Station number | Characteristics of the screenings | Largest species | Most abundant or conspicuous species |
|---|---|---|---|
| 7175 | - - - | - - - | - - - |
| 6854 | muddy debris, tubes and worms | sipunculid, *Cerebratulus* | *Dentalium rectius*, *Spiophanes* |
| 7174 | ophiuroids, worms, mud | *Brisaster townsendi* | *Myriochele*, *Chloeia*, *Spiophanes* |
| | | | |
| 6501 | brissopsids, worms, mud | *Arhynchite*, *Brisaster* | *Pectinaria*, *Saxicavella* |
| 7160 | shell, sand, *Cadulus*, *Dentalium*, waxy lumps, worms, mollusks | none | *Pectinaria*, *Chloeia*, *Heteromastus* |
| 2219 | dead *Cadulus*, *Amphissa*, *Leda*, *Cardita*, worms | brissopsids | *Chloeia*, *Maldane* |
| 2218 | muddy tubes and worms | *Aphrodita* | *Chloeia*, *Pista disjuncta* |
| 5639 | muddy debris, foraminiferans, brissopsids, worms | *Brissopsis* | *Maldane*, *Chloeia*, *Pectinaria* |
| 7155 | cinders, waxy lumps, shell fragments, worms | *Brisaster townsendi* | *Maldane sarsi* |
| 2317 | siliceous sponge, brissopsids, worms | brissopsid, *Cerebratulus* | *Lysippe annectens*, spionids |
| 6503 | blackened tubes, waxy lumps, black plant debris | nemertean, ghost shrimp | *Lysippe annectens* |
| 2336 | muddy debris, worms | none | *Leiochrides*, *Lysippe*, solenogasters |
| 6861 | friable to hard dark brown pitch, trace siliceous sponge | ophiuroids | none |
| 7498 | mud with wormlike animals | *Brisaster* | none |

# NEWPORT CANYON

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | | |
| *Amaeana occidentalis* | 10 | 2 | 4 | | 1 | | | | | | | | | | | |
| *Ancistrosyllis tentaculata* | 8 | 31 | 67 | 265 | 72 | | 19 | 1 | | 12 | 2 | | | | | |
| *Anotomastus gordiodes* | 2 | | | | | | | | | | | | | | | |
| *Aricidea lopezi* | 1 | | 2 | 4 | | | | | | 6 | 3 | ?1 | 1 | | | |
| *Aricidea uschakowi* | 15 | | | | | | | | | 1 | 6 | ?2 | | | | ?1 |
| *Aricidea*, nr *suecica* | 1 | | | | 1 | | | | | | | | | | | |
| *Arabella iricolor* | ?1- | | | | | | | | | | | | | | | |
| *Brada pilosa* | 7 | 7 | 7 | | 2 | | | | | | 1 | | 7 | | | |
| *Chaetozone corona* | 121 | | 5 | | 1 | | | | | | | | | | | |
| *Chaetozone* sp. | 12 sm | | | | | | | | | | | | | | 1 | |
| *Cossura candida* | 182 | 8 | 3 | 1 | 15 | | 3 | | 1 | 9 | 9 | | | | | |
| *Eteone* sp. | 1 sm | | | | | | | | | | | | | | | |
| *Glycera americana* | 6 lg | 1 | | 4 | 3 | | | | 1 | | | | | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | | |
| *Goniada brunnea* | 1 | | 2 | 5 | 3 | | 9 | | 2 | 5 | 4 | | | | | |
| *Goniada littorea* | 61 | | | | | | | | | | | | | | | |
| *Haploscoloplos elongatus* | 132 | | | | 1 | | | | | 5 | 2 | 2 | 3 | | | 1 jv |
| *Harmothoë*, nr *lunulata* | 8 | 3 | 2 | | | | | | 2 | | | | | | | |
| *Harmothoë priops* | 8 | | 2 | 3 | | | 2 | | | | | | | | | |
| *Heteromastus filobranchus* | ?4 | 1 lg | | 23 lg | 12 | 8 | | | | 24 lg | | | 6 | | | |
| *Laonice cirrata (?foliata)* | ?8 | | | | | | | | | | | | | | | |
| *Lumbrineris minima* | 20+ | | | | | | | | | | | | | | | |
| *Lumbrineris* sp. | 5 | | 2 | | | 1 frg | | | | | | | | | | 2 jv |
| *Magelona* sp. | 22 sm | | | | | | | | | | | | | | | |
| *Melinna heterodonta* | 1 | | | | | | 2 | | | | 2 | | | | | |
| *Mediomastus californiensis* | 114+ | 33 | 28 | 12 | | | 162 | | 1 | 7 | 160+ | | | | | |
| *Nerinides pigmentata* | 12 | | | | | | | | | | | | | | | |
| *Nothria elegans* | 2 lg | | | | | | | | | | | | | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | < 5.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | | |
| *Nereis procera* | 25 | | | | 5 | | 13 | 1 lg | 7 lg | | | | | | | |
| *Nereis*, other sp. | 1 | | | | | | | | | | | | | | | |
| *Nephtys caecoides* | 13 | | | | | | | | | | | | | | | |
| oweniid | 79 | | | | | | | | | | | | | | | |
| *Oxydromus a. glabrus* | 1 | 3 | | 4 | 15 | | | | | 4 | | | | 5 | | |
| *Paraonis gracilis* | 12+ | | | 12 | | | 1 | 1 | 2 | 13 | 3 | 1 | 57 | 5 | 3 | 4 |
| *Pectinaria californiensis* | 14 sm | 2 | 23 | 315 | 47 | 58 | 23 | 32 | 55 | 169 | 46 | 36 | 15 | | | |
| ?*Eumida* sp. | 1 | | | | | | 1 | | 1 | 1 | 2 | | | | | |
| *Pilargis maculata* | 1 | | 1 frg | | | | | | | | | | | | | |
| *Pista disjuncta* | 12 | | | | 1 | 7 | 73 | 14 | 68 | 71 | 35 | | | | | |
| *Praxillella a. pacifica* or sp. | 2 lg | | | 5 lg | 2 | 1 | 8 | | 4 lg | | | | | 2 | | |
| *Prionospio cirrifera* | 168+ | ?145 | 140 | 12 | | | | | | ?35 | | | | | | |
| *Prionospio malmgreni* | 2 | 1 | 1 | | 7 | | | | 3 | 2 | 3 jv | | | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ...... | ....... | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | .... |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | | |
| *Prionospio pinnata* | 32 | 28 lg | 16 | 4 lg | 15 | 1 | 6 | 5 | 15 | 24 | 15 | 8 | | 2 jv | | |
| *Sthenelanella uniformis* | 2 | | | | 47 | | | | | | | | | | | |
| *Sthenelais* sp. | 1 jv | | | | | | | | | | | | | | | |
| *Telepsavus* sp. | 1 jv | | | | 2 | | | | | | | | | | | |
| *Tharyx monilaris* | 26+ | 206 | 340+ | | 10jv | | 6 | | 2 | 6 | 10 | | 4 | 7 | 6 | 8 |
| *Tharyx tesselata* | 68+ | | | 22 | | | 3 | 8 | 6 | 1 | 11 | 1 | | ?6 | 4 | 24 |
| (polychaetes, dupl. spec.) | 500+) | | | | | | | | | | | | | | | |
| *Glycera robusta* | | 2 | 2 lg | 2 lg | | | 2 lg | | 1 lg | | | | | | | |
| *Glycera*, chiefly *capitata* | | 15sm | 44 | | 25 | 11 | 18 | 8 | 18 | 26 | 20 | | | | | |
| *Laonice foliata* | | 1 | 1 | | | | 6 | 1 lg | 5 | 6 | 3 | | | | | |
| *Loandalia ?fauveli* | | 3 | | | | | | | | | | | | | | |
| *Lumbrineris acuta* | | 2 | | | | | | | | | | | | | | |
| *Lumbrineris cruzensis* | | 8 | 8 | 10 | | | 5 | 7 | 8 | | 19 | | 1 | 1 jv | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | .... |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | | |
| *Lumbrineris index* | | 1 lg | 5 | | | | | | | | | | | | | |
| *Maldane sarsi* | | | 1 sm | | | 1 | 6 | | 22 | | 18 | 1 lg | | 2 jv | | 3 |
| *Nephtys ferruginea* | | 2 | | | 2 | | | 3 | 1 | 1 | | | | | | |
| *Notomastus* sp. | | 2 lg | | | | | | | | | 1 frg | | | | | |
| ?*Phyllodoce* sp. | | 1 | | | | | | | | 2 | | | | | | |
| *Poecilochaetus johnsoni* | | ?1 | ?4 | | 3 | | | | | | | | | | | |
| hesionid | | | 4 | | | | | | | | | | 1 frg | | | |
| *Polydora* sp. | | | 1 | | | | | | 1 | | | | | 3 | | |
| *Spio punctata* | | | 3 jv | | | | | | | | | | | | | |
| *Capitella capitata* subspp. | | | | 2 | 2 | | | | | 7 | 1 | | 1 | | | |
| *Eupolymnia* sp. | | | | ?5 jv | | | | | | | | | | | | |
| *Glycera tenuis* | | | | ?11 | | | | | | | | | | | | |
| *Lepidasthenia longicirrata* | | | | 5 lg | | | 10 | | ?3 | | | | | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | | |
| *Nephtys* sp. | | | | 2 jv | | | | | 15 jv | 59 jv | 11 | | 5 sm | 4 sm | | 1 |
| *Nereis* sp. | | | | 3 | | | | | | | | | | | | |
| *Nothria* sp. | | | | 1- | | | | | | | | | | | | |
| *Ninoë gemmea* | | | | 2 | | | | | | | | | | | | |
| *Pherusa* sp. | | | | 1 jv | | | | | | | | | | | | |
| *Pilargis berkeleyi* | | | | 1 | | | | | | | | | | | | |
| *Spiophanes fimbriata* or sp. | | | | 19 | 3 | 3 | 3 | 4 | 10 | 1 | 10 | | | 1 | 1 | |
| ampharetids | | | | | 4 sm | | | | | | | | | | | |
| *Anaitides madeirensis* | | | | | 2 | | 1 | | | | | | | | | |
| *Axiothella rubrocincta* | | | | | 2 | | | | | | | | | | | |
| *Dorvillea articulata* | | | | | 1 | | 2 | 2 | | | 1 jv | | | | | |
| *Drilonereis nuda* | | | | | 1 | | | | | | | | | | | |
| *Eunice americana* | | | | | 1 | | | | | | | | | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | | |
| *Hesperonoë laevis* or sp. | | | | | 5 | | | | | | | 1 | | | | |
| *Hyalinoecia juvenalis* | | | | | 1 | | | | | | | | | | | |
| *Langerhansia heterochaeta* | | | | | 2 | | | | | | | | | | | |
| *Lumbrineris californiensis* | | | | | 1 | | | | | | | | | | | |
| *Lumbrineris latreilli* | | | | | 4 | | | | | | | | | | | |
| *Magelona pacifica* | | | | | 4 | | | | | | | | | | | |
| *Notomastus hemipodus* | | | | | 10 | | | | | | | | | | | |
| *Onuphis parva* | | | | | 1 | 1 | 1 | | | | | | | | | |
| *Pherusa capulata* | | | | | 1 | | | | | | | | | | | |
| *Pherusa neopapillata* | | | | | 1 | | | | | | | | | | | |
| *Pholoë glabra* | | | | | 8 | | 3 | 12 | | 1 | | | | | | |
| *Pista* cf. *cristata* | | | | | 2 | | | | | | | | | | | |
| *Polycirrus* sp. | | | | | 1 | | | | | | | | | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | | |
| *Rhodine bitorquata* or sp. | | | | | 1 | | | 2 | | | | | | | | 1- |
| *Spiophanes missionensis* | | | | | 8 | | | | | | | | | | | |
| *Sthenelais tertiaglabra* | | | | | 2 | | | | | | | | | | | |
| *Sternaspis fossor* | | | | | 5 | | 2 | | 2 | | | | | | | |
| *Streblosoma crassibranchia* | | | | | 1 | | | | | | | | | | | |
| *Thormora johnstoni* | | | | | 1 | | | | | | | | | | | |
| *Brada pluribranchiata* | | | | | | 1 | 4 | 2 | 1 | | | 3 lg | | | | |
| *Glycinde armigera* | | | | | | 2 | | | | | | | | | | |
| *Scalibregma inflatum* | | | | | | 1 | | | | | | | | | | |
| *Asychis disparidentata* | | | | 2 | | | 1 | | | | | | | | | |
| *Ceratocephala c. americana* | | | | | | | 2 | | | | | | 1 | | | |
| *Harmothoë* sp., reticulate | | | | | | | 1 | | 3 | | | | | | | |
| *Isocirrus* sp. | | | | | | | 1 | | | | | | | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | | |
| *Nothria iridescens* | | | | | | | 14 | | | | 12 | | | | | |
| *Phyllochaetopterus limicolus* | | | | | | | 1 lg | 2 | | | | | | | | lg tube |
| *Terebellides stroemi* | | | | | | | 1 | 1 | | | 3 | | | 1 sm | | |
| *Chloeia pinnata* | | | | | | | | 1 | | | | | | | | |
| *Harmothoë* sp. | | | | | | | | 2 | | | | | 1 | | | |
| *Nephtys assignis* | | | | | | | | 2 lg | | | | | | | | |
| *Notomastus tenuis* | | | | | | | | 4 | | | | | | | | |
| *Travisia* sp. | | | | | | | | 1 | | | | | | | | |
| *Lumbrineris bicirrata* | | | | | | | | | 1 | | | | | | | |
| *Onuphis ?vexillaria*, or sp. | | | | | | | | | 1 | 1 | | | 1 | | | |
| *Chone* sp. | | | | | | | | | | 1 | | | | | | |
| *Lumbrineris ?limicola* | | | | | | | | | | 6 sm | | | | | | |
| pilargiid | | | | | | | | | | 1 | | | | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | .741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay grave | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | | |
| ?*Aglaophamus* sp. | | | | | | | | | | | 15 | | | | | |
| ?*Anaitides* sp. | | | | | | | | | | | 2 sm | | | | | |
| *Lumbrineris* cf. *bassi* | | | | | | | | | | | 5 | | | | | |
| *Aglaophamus erectans* | | | | | | | | | | | | 3 | | | | |
| *Ammotrypane aulogaster* | | | | | | | | | | | | 3 | | | | |
| *Aricidea (C.) aciculata* | | | | | | | | | | | | 1 | 1 | | | |
| *Brada glabra* | | | | | | | | | | | | 1 | | | | |
| *Goniada annulata* | | | | | | | | | | | | 1 | 3 | | | |
| *Nothria pallida* | | | | | | | | | 14 | 5 lg | | 3 | | | | |
| *Pilargis* sp. (*hamatus*?) | | | | | | | | | | | | 2 | | | | |
| *Praxillella* sp. | | | | | | | | | | 1- | | 1 lg | | | ?12 | 1- |
| *Myriochele* sp. | | | | | | | | | | | | | 1 | 3 | | |
| *Prionospio*, unknown sp. | | | | | | | | | | | | | 8 | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | 5.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | | |
| *Antinoella* sp. | | | | | | | | | | | | | | 1 | 1 | |
| *Aricidea lopezi rubra* | | | | | | | | | | | | | | 105 | ?17 | 1 |
| *Glycera c. branchiopoda* | | | | | | | | | | | | | | 4 | 3 | 4 |
| *Cirratulus* sp. (anoculate) | | | | | | | | | | | | | | 1 jv | | 1 |
| ?*Lanice* sp. | | | | | | | | | | | | | | 1 lg | | |
| *Euclymene* or *Axiothella* sp. | | | | | | | | | | | | | | 10 jv | | |
| *Lysippe annectens* | | | | | | | | | | | | | | 12 | 24 | ?14 |
| *Lumbriclymene* ?*lineus* | | | | | | | | | | | | | | 1 frg | | |
| *Melinnexis* sp. | | | | | | | | | | | | | | 4 lg | | |
| *Spiophanes* sp. | | | | | | | | | | | | | | 1 | | 4- |
| *Amphicteis* sp. | | | | | | | | | | | | | | | | 7 |
| *Aricidea ramosa* | | | | | | | | | | | | | | | | 3 |
| *Aricidea* spp. | | | | | | | | | | | | | | | | 7 |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **POLYCHAETES** | | | | | | | | | | | | | | | | |
| *Califia calida* | | | | | | | | | | | | | | | | 1 |
| *Drilonereis* sp. | | | | | | | | | | | | | | | | 2 |
| *Leanira* sp. | | | | | | | | | | | | | | | | 1- |
| *Leiochrides hemipodus* | | | | | | | | | | | | | | | | 2 |
| *Oxydromus* sp. | | | | | | | | | | | | | | | | 1 |
| terebellid, unknown | | | | | | | | | | | | | | | | 4 |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ...... | ...... | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ...... |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **ECHINODERMS** | | | | | | | | | | | | | | | | |
| *Amphipholis squamata* | 10 | 6 | 5 | | 3 | | | | | | | | 4 | | 2 | |
| *Amphiodia urtica* | 3 | 13 | 19 | | 45 | | ?4 | 16 | | | | | | | | |
| *Ophiura lütkeni* | | | 1 | | | | | | | | | | | | | |
| *Amphioplus strongyloplax* | | | | | 5 | | | 16 | | | | | | | | |
| *Leptosynapta albicans* | | | | | 6 | | | | | | | | | | | |
| ophiuroids | | | | 9 sm | | | | | 4 | 5 sm | 1 frg | 1 | | | | |
| *Amphiacanta amphacantha* | | | | | | | | 3 | | | | | | | | |
| *Brisaster townsendi* | | | | | | | | 1 lg | 1 lg | | | | | | | |
| *Molpadia intermedia* | | | | | | | | | 1 lg | | | | | | | |
| *Ophiothrix spiculata* | | | | | | | | | 1 | | | | | | | |
| *Brissopsis pacifica* | | | | | | | | | | | | 2 | 3 lg | | 2 | |
| *Ophiomusium jolliensis* | | | | | | | | | | | | | | 1 | | |
| holothurian | | | | | | | | | | | | | | | 1 | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | 5.0 |
| **ECHINODERMS** | | | | | | | | | | | | | | | | |
| *Asteronyx loveni* | | | | | | | | | | | | | | | | 1 lg |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **MOLLUSKS** | | | | | | | | | | | | | | | | |
| *Acteon punctocoelata* | pres. | | 50+ | many | 4 | | | | | | | | | | | |
| *Nassarius perpinguis* | pres. | | 15 | many | 9 | | | | | | | | | | | |
| *Mitrella carinata* | | | 3 | | | | | | | | | | | | | |
| clams, small | pres. | pres. | | ca 15 | | | ca 15 | | | | | | 6 | | | |
| gastropods, small | pres. | pres. | | ca 80 | 1 | | ca 20 | | | | | | 8 | | | |
| *Bittium* sp. | | | | | 3 | | | | | | | | 15 | | | |
| *Cylichnella diegensis* | | | | | 5 | | 5+ | | | 1 | 1 | | | | | |
| *Epitonium* sp. | | | | | 3 | | | | | | | | | | | |
| *Eulima* sp. | | | | | 2 | | | | | | | | | | | |
| *Mangelia* sp. | | | | | 11 | | | | | | | | | | | |
| *Mitrella ?tuberosa* | | | | | 1 | | | | | | | | | | | |
| *?Turbonilla* sp. | | | | | 1 | | | | | | | | | | | |
| *Axinopsida serricatus* | | | | | 2 | | | | | | | | | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **MOLLUSKS** | | | | | | | | | | | | | | | | |
| *?Chlamys latiauratus* | | | | | 3 | | | | | | | | | | | |
| *Compsomyax subdiaphana* | | | | | 3 | | | | | 1 lg | | | | | | |
| *Crenella decussata* | | | | | 1 | | | | | | | | | | | |
| *Kellia* sp. | | | | | 1 | | | | | | | | | | | |
| *?Linga* sp. | | | | | 3 | | | | | | | | | | | |
| *Macoma ?yoldiformis* | | | | | 2 | | | | | | | | | | | |
| *Nemocardium centifilosum* | | | | | 2 | | | | | | | | | | | |
| *Periploma discus* | | | | | 8 | | | | | | | | | | | |
| *Rochefortia* sp. | | | | | 2 | | | | | | | | | | | ?2 |
| *Saxicavella pacifica* | | | | | 1 | | | | | | 7 | 10 | 17 | | | |
| *Thyasira* sp. | | | | | 1 | | | | | | | | | | | |
| *Cadulus* sp. | | | | | 2 | | | | | | | 7 | | | | |
| *Dentalium neohexagonum* | | | | | 1 | | | | | | | | | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **MOLLUSKS** | | | | | | | | | | | | | | | | |
| *Dentalium rectius*, or sp. | | | | 1 | ?3 | 8 | 34 | 50+ | 8 | | 1 lg | 1 | | | | |
| *Macoma* sp. | | | | | | 1 | | | 1 | | | | | | | |
| *Prochaetoderma* sp. | | | | | | | 3 | 2 | | 4 | | | 1 | 10 | | 2 |
| *Acila castrensis* | | | | | | | 26 | | 110 | 1 | | | | | | |
| *Cardita ventricosa* | | | | | | | 3 | | 4 | | | | | | | |
| *Cuspidaria* sp. | | | | | | | | | 1 | | | | | | | |
| *Yoldia scissurata* | | | | | | | 2 lg | | 2 | | | | | | | |
| ?*Amphissa* sp. | | | | | | | | | 1 | | | | | | | |
| *Crystallophrisson* spp. | | | | | | | 1 | | 4 | 3 | 1 | 5 | 2 | 1 | 3 | 8 |
| *Nucula* sp. | | | | | | | | | | | | 1 | | | | |
| *Yoldia* sp. | | | | | | | | | | | | | 3 | | | |
| nudibranchs | | | | | | | | | | | | | 1 | | | |
| *Mitrella permodesta* | | | | | | | | | | | | | | 27 | 49 | 2 |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | 5.0 |
| **MOLLUSKS** | | | | | | | | | | | | | | | | |
| *Lyonsiella alaskana* | | | | | | | | | | | | | | 1 | | |
| *Dacrydium pacificum* | | | | | | | | | | | | | | 1 | | |
| clams, small clay-covered | | | | | | | | | | | | | | | 16 | 8 |
| *Cadulus tolmiei* | | | | | | | | | | | | | | | | 2 |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **CRUSTACEANS** | | | | | | | | | | | | | | | | |
| pinnotherid crabs | 100+ | 35 | 37 | 2 | 11 | | | | | 1 jv | | | 2 | | | |
| cirriped, *Scalpellum* | | | | | 5 | | | | | | | | | | | |
| callianassid crab | | | | | 1 | | | | | | | | | | | |
| crab, other | | | | | 1 | | | | | | | | | | | |
| Amphipods | 21 | 8 | 28 | 12 | | | 14 | 22 | 37 | 4 | 1 | 9 | 12 | 4 | 1 | 9 |
| *Ampelisca brevisimulata* | | | | | 13 | | | | | | | | | | | |
| *Ampelisca cristata* | | | | | 1 | | | | | | | | | | | |
| *Ampelisca vera* | | | | | 15 | | | | | | | | | | | |
| *Amphideutopus oculatus* | | | | | 3 | | | | | | | | | | | |
| *Aruga oculata* | | | | | 3 | | | | | | | | | | | |
| *Heterophoxus oculatus* | | | | | 1 | | | | | | | | | | | |
| *Listriella goleta* | | | | | 10 | | | | | | | | | | | |
| *Listriella eriopsis* | | | | | 1 | | | | | | | | | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **CRUSTACEANS** | | | | | | | | | | | | | | | | |
| lysianassid | | | | | 1 | | | | | | | | | | | |
| *Metaphoxus frequens* | | | | | 1 | | | | | | | | | | | |
| *Paraphoxus epistomus* | | | | | 1 | | | | | | | | | | | |
| *Paraphoxus bicuspidatus* | | | | | 8 | | | | | | | | | | | |
| *Paraphoxus similis* | | | | | 8 | | | | | | | | | | | |
| *Photis* sp. | | | | | 3 | | | | | | | | | | | |
| phoxocephalids | | | | | | | | | | | | 17 | | | | |
| Caprellids | | | | | | | | | | | | | | | | 5 |
| Isopods | | | | | | | | | | | | | | | | |
| *Gnathia crenulatifrons* | | | | | 1 | | | 7 | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| *Haliophasma geminata* | | | | | 5 | | | | | | | | | | | |
| ?*Macrostylis* sp. | | | | | | | | | | | | | 2 | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | 5.0 |
| **CRUSTACEANS** | | | | | | | | | | | | | | | | |
| Ostracods | | | | | | | | | | | | | | | | 7 in 3 spp. |
| brown ostracod | | | | | 3 | | 1 | | | | | 1 | | 1 | | |
| oval ostracod | | | | | 2 | | | | | | | | | | | |
| rectangular ostracod | | | | | 3 | | | | | | | | 1 | | | |
| Tanaids | 1 | | | | | | | | | | | | | | | 1 |
| Cumaceans | | | | | 1 | | 1 | | 1 | | | | | | | |
| *Diastylopsis tenuis* | 6 | | | | | | | | | | | | | | | |
| *Diastylis*, nr *stygia* | 1 | | | | | | | | | | | | | | | |
| *Hemilamprops californica* | 1 | | | | 2 | | | | | | | | | | | |
| red cumacean | | | | | | | | | | | | 3 | | | | |
| serrated cumacean | | | | | | | | | | | | 2 | | | | |
| *Campylaspis* sp. | | | | | | | | | | | | | 4 | | | |
| *Eudorella pacifica* | | | | | | | | | | | | | 3 | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **CRUSTACEANS** | | | | | | | | | | | | | | | | |
| Copepods | | | | | 1 | | | | | | | | | | | |
| **OTHERS** | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| ?*Harenactis* sp. | 54 | | | | 2 | | | | | | | | | | | |
| sea whip, slender | | | | | | | | | | | | | | | 1 sm | |
| sea pen, broad pannicled | | | | | | | | | | | | | | | 1 | |
| anemone, smooth white | | | | | | | | 1 sm | | | | 2 | | | | |
| anemone, warty epithelium | | | | | | | | | | | 1 | | | | 1 | |
| anemone, others | | | | | | | | | | | | | 2 | | | |
| ceriantharian | | | | | 10 | | | | | | | | 2 | | | |
| actinian with clavate tentacles | | | | | | | | | | | | | | | 1 | |
| polyclad | 10 | | 4 | | 2 | | 2 | | | | | | | | | |
| nemerteans | 55 | 13 | 21 | | | | | 1 | 2 | | 2 | 1 lg | 4 | 6 sm | 1 | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand, mud | sand, mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | ........ | ........ | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | ........ |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | <5.0 |
| **OTHERS** | | | | | | | | | | | | | | | | |
| *Cerebratulus* | 1 lg | 1 lg | | | | | 1 lg | | | | 2 | | | | | |
| echiuroid | | | | | | | | | | | 3- | | 1 | 1 | | |
| sipunculid | | | | | | | | | | | | 1 lg | | | | |
| oligochaete | 1 | | | | | | | | | | | | | | | |
| *Glottidia albida* | 1 sm | | | 1 sm | 2 | | 1 sm | | | | | | | | | |
| enteropneust, ?*Schizocardium* | 4 | 6 lg | 1 lg | | 2 | | | | | | | | | | | |
| other kind | | | | | | | | | | | | | | 5 | 5 | |
| *Branchiostoma* sp. | | | | | | 1 | | | | | | | | | 1 sm | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

## NEWPORT CANYON *(Continued)*

| Station number | 7031 | 5006 | 5250 | 7030 | 5367 | 5661 | 7029 | 7054 | 7729 | 7730 | 7028 | 7052 | 7032 | 7051 | 7050 | 7728 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 16 | 37 | 37 | 85 | 97 | 140 | 170 | 178 | 211 | 235 | 272 | 420 | 478 | 553 | 642 | 741 |
| Kind of sediment | silt, shell gravel | sand | silt | mud | sand | sand | silt | mud, clay gravel | mud | mud | silt | mud, gravel | mud, sand | sand mud | sand mud | mud |
| Gear used | CG | OPG | OPG | CG | OPG | OPG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.51 | 2.52 | 2.2 | 5.38 | 3.15 | 3.4 | 3.73 | 5.38 | — | — | 0.57 | 3.59 | 1.14 | 0.49 | 0.64 | — |
| Wt. of animals, gms. | 47.9 | 40.0 | 38.9 | 73.0 | 51.1 | 21.5 | 56.5 | 43.1 | 253.2 | 57.85 | 33.9 | 43.6 | 30.8 | 13.7 | 24.0 | 45.0 |
| **NUMBERS OF POLYCHAETES** | | | | | | | | | | | | | | | | |
| Species | 47 | 26 | 25 | 29 | 50 | 13 | 35 | 23 | 31 | 32 | 31 | 18 | 18 | 23 | 10 | 24 |
| Specimens | 1726 | 509 | 718 | 757 | 367 | 96 | 415 | 116 | 276 | 513 | 435 | 71 | 117 | 182 | 72 | 98 |
| **ECHINODERMS** | | | | | | | | | | | | | | | | |
| Species | 2 | 2 | 3 | 1 | 4 | 0 | 1 | 4 | 4 | 1 | 2 | 2 | 2 | 1 | 3 | 1 |
| Specimens | 13 | 19 | 25 | 9 | 59 | 0 | 4 | 36 | 7 | 5 | 2 | 3 | 7 | 1 | 5 | 1 |
| **MOLLUSKS** | | | | | | | | | | | | | | | | |
| Species | p | p | 3 | 5 | 25 | 2 | 9 | 2 | 8 | 7 | 4 | 6 | 9+ | 5 | 3 | 8 |
| Specimens | p | p | 68 | 96+ | 75 | 9 | 109 | 52+ | 131 | 13 | 10 | 24 | 56 | 40 | 68 | 25 |
| **CRUSTACEANS** | | | | | | | | | | | | | | | | |
| Species | 6 | 2 | 2 | 2 | 26 | 0 | 3 | 2 | 2+ | 2 | 1 | 5+ | 6+ | 2 | 1 | 6 |
| Specimens | 130+ | 43 | 65 | 14 | 105 | 0 | 16 | 29 | 38 | 5 | 1 | 33 | 24 | 5 | 1 | 22 |
| **OTHERS** | | | | | | | | | | | | | | | | |
| Species | 7 | 3 | 3 | 1 | 5 | 1 | 3 | 2 | 1 | 1 | 4 | 3 | 4 | 3 | 6 | 4 |
| Specimens | 126 | 20 | 26 | 1 | 18 | 1 | 4 | 2 | 2+ | 2 | 8 | 4 | 9 | 13 | 10 | 5 |
| **TOTALS** | | | | | | | | | | | | | | | | |
| Species | 62 | 33 | 36 | 38 | 110 | 16 | 51 | 33 | 46+ | 43 | 42 | 34+ | 39+ | 34 | 23 | 43 |
| Specimens | 1995+ | 591 | 902 | 877+ | 624 | 106 | 548 | 235+ | 454+ | 538 | 456 | 135 | 213 | 241 | 156 | 151 |

## NEWPORT CANYON *(Continued)*

| Station number | Characteristics of the screenings | Largest species | Most conspicuous or abundant species |
|---|---|---|---|
| 7031 | woody debris, small worms, small commensal crabs | nemertean, enteropneust | *Cossura*, *Haploscoloplos*, *Prionospio cirrifera* |
| 5006 | biological detritus, worms | *Glycera robusta*, enteropneust | *Tharyx*, *Prionospio cirrifera* |
| 5250 | biological detritus, worms | *Glycera robusta*, enteropneust | *Tharyx*, *Prionospio cirrifera* |
| 7030 | small amount heavy debris with worms | *Glycera robusta*, | *Pectinaria*, *Ancistrosylis* |
| 5367 | biological debris, worms, other small animals | *Glycera americana*, *Heteromastus* | *Pectinaria*, *Sthenelanella*, *Ancistrosyllis* |
| 5661 | coarse shell, sand, flocculent debris, worms | *Pista disjuncta* | *Pectinaria*, *Dentalium* |
| 7029 | muddy, silty debris, dead *Pectinaria*, dead *Acila* | nemertean | none |
| 7054 | shelly debris, tubes, animals | *Nephtys assignis*, *Brisaster* | *Dentalium*, *Pectinaria*, *Pista disjuncta* |
| 7729 | silt with animals | *Molpadia intermedia*, *Brisaster* | *Pista disjuncta*, *Acila castrensis* |
| 7730 | woody debris, dead *Cellularia*, living tubes of worms | *Compsomyax*, *Yoldia scissurata* | *Pectinaria* |
| 7028 | silty debris, mud tubes, worms | *Pista disjuncta*, nemertean | *Pectinaria*, *Maldane*, *Mediomastus* |
| 7052 | silt, worm tubes, brissopsids, other animals | ?*Arhynchite*, nemertean, brissopsid | *Pectinaria* |
| 7032 | flocculent debris, brissopsids, other animals | brissopsids, *Onuphis vexillaria* | *Pectinaria*, *Paraonis*, *Saxicavella* |
| 7051 | arenaceous forams., tubes of ampharetids | thalassemid, *Melinnexis* | *Mitrella permodesta*, *Aricidea* |
| 7050 | foraminifers, brissopsid and sponge spines, worms | *Brissopsis* | *Mitrella*, *Lysippe* |
| 7728 | silt, arenaceous forams., animals | *Asteronyx loveni*, sea whip, tube of *Phyllochaetopterus* | *Tharyx*, ampharetids |

## SAN DIEGO TRENCH, NORTHERN END[1]

| Station number | 7404 | 7403 | 7402 | 7396 | 7399 | 7395 |
|---|---|---|---|---|---|---|
| Depth in meters | 686 | 734 | 768 | 840 | 844 | 846 |
| Kind of sediment | green mud | green mud, sand | coarse gravel | sand, green mud | sand, green mud | green mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | ←— | —— | —(volumes | not taken)— | —— | —→ |
| Wt. of animals, gms. | <0.5 | 1.6 | 3.7 | 4.4 | 3.4 | <0.5 |
| **POLYCHAETES** | | | | | | |
| *Asychis disparidentata* | ?1 frg | | | | | |
| *Califia calida* | 1 | | | | | |
| *Glycera c. branchiopoda* | 1 | 2 lg | 1 lg | 1 | ?1 | 1 |
| *Haploscoloplos elongatus* | 1 | | | 1 | | |
| *Lysippe annectens* | 1- | | 3 | | | |
| *Phyllochaetopterus limicolus* | 1 | | | 2 | | |
| ampharetid | | 2 | 1 | 4 | | 2 |
| *Melinna* sp., with long branchiae | | 1 | | | | |
| *Myriochele gracilis* or *pygidialis* | | 1 | 1 | 47 | 45 | |
| *Paraonis gracilis* or subsp. | | 1 | 6 | 1 | 2 | |
| *Spiophanes pallidus* | | 1 | 1 | | 2 | |
| *Tharyx monilaris* or sp. | | 2 | 7 | 12 | 1 | 1 |
| *Aricidea (Aedicira)* sp. | | | 2 | | | |

[1] The southern end, in basin depths, 1420 meters, is discussed in Hartman and Barnard, 1960, p. 273.

## SAN DIEGO TRENCH, NORTHERN END *(Continued)*

| Station number | 7404 | 7403 | 7402 | 7396 | 7399 | 7395 |
|---|---|---|---|---|---|---|
| Depth in meters | 686 | 734 | 768 | 840 | 844 | 846 |
| Kind of sediment | green mud | green mud, sand | coarse gravel | sand, green mud | sand, green mud | green mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | (volumes not taken) | | | | | |
| Wt. of animals, gms. | <0.5 | 1.6 | 3.7 | 4.4 | 3.4 | <0.5 |
| **POLYCHAETES** | | | | | | |
| *Aricidea ramosa* | | | 1 | 1 | 2 | |
| *Cossura candida* | | | 1 | 1 | | |
| *Leiochrides hemipodus* | | | 2 | | | 1 |
| *Maldane cristata* or *sarsi* | | | 5 | 1 | | |
| protulid | | | 1 | | | |
| *Terebellides ?stroemi* | | | 2 | 5 | | 1 |
| *Brada pilosa* | | | | 1 | | |
| *Ceratocephala loveni pacifica* | | | | 2 | | |
| *Drilonereis* sp. | | | | 1 | 2 | |
| *Leanira alba* | | | | 1 | | |
| *Heterospio* sp. palp only | | | | 1 | | |
| *Lumbrineris* sp. | | | | 2 | | |
| *Praxillella affinis pacifica* | | | | 1 | | |

## SAN DIEGO TRENCH, NORTHERN END *(Continued)*

| Station number | 7404 | 7403 | 7402 | 7396 | 7399 | 7395 |
|---|---|---|---|---|---|---|
| Depth in meters | 686 | 734 | 768 | 840 | 844 | 846 |
| Kind of sediment | green mud | green mud, sand | coarse gravel | sand, green mud | sand, green mud | green mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | ← | | (volumes not taken) | | | → |
| Wt. of animals, gms. | <0.5 | 1.6 | 3.7 | 4.4 | 3.4 | <0.5 |
| **POLYCHAETES** | | | | | | |
| *Lumbriclymene* sp. | | | | | 1 | |
| *Onuphis vexillaria* | | | | | 1 lg | |
| *Ninoë gemmea* | | | | | | 1 |
| **ECHINODERMS** | | | | | | |
| *Amphiura seminuda* | | | 4 | 7 | | 1 |
| *Amphipholis pugetana* | | | 2 | | | |
| *Echinocyamus* sp.? | | | 1 | | | |
| *Brissopsis pacifica* | | | | 1 sm | | |
| *Ophiura kofoidi* | | | | 1 lg | | |
| *Amphiura arcystata* | | | | | 1 | |
| *Amphiura gymnopora* | | | | | 1 | |
| *Ophiomusium jolliensis* | | | | | | 1 |
| | | | | | | |

## SAN DIEGO TRENCH, NORTHERN END *(Continued)*

| | | | | | | |
|---|---|---|---|---|---|---|
| Station number | 7404 | 7403 | 7402 | 7396 | 7399 | 7395 |
| Depth in meters | 686 | 734 | 768 | 840 | 844 | 846 |
| Kind of sediment | green mud | green mud, sand | coarse gravel | sand, green mud | sand, green mud | green mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | ← | | (volumes not taken) | | | → |
| Wt. of animals, gms. | <0.5 | 1.6 | 3.7 | 4.4 | 3.4 | <0.5 |
| **MOLLUSKS** | | | | | | |
| *Dacrydium pacificum* | 1 | | 1 | 1 | | |
| clam, small white | | 1 | 6 | 6 | 2 | |
| clam, small clay-covered | | | 8 | | | |
| *Mitrella permodesta* | | | 1 | | | |
| snail, large | | | 1 | | | |
| *Cadulus tolmiei* | | | | 9 | 2 | 1 |
| solenogasters | | | | 2 | | 2 |
| *Crystallophrisson* sp. | | | | | | 1 |
| **CRUSTACEANS** | | | | | | |
| amphipods | | 1 | 1 | 8 | 1 | 2 |
| ostracods | | | 1 | 2 | | |
| caprellid | | | | 1 | | |
| | | | | | | |

## SAN DIEGO TRENCH, NORTHERN END *(Continued)*

| | | | | | | |
|---|---|---|---|---|---|---|
| Station number | 7404 | 7403 | 7402 | 7396 | 7399 | 7395 |
| Depth in meters | 686 | 734 | 768 | 840 | 844 | 846 |
| Kind of sediment | green mud | green mud, sand | coarse gravel | sand, green mud | sand, green mud | green mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | ← (volumes not taken) → | | | | | |
| Wt. of animals, gms. | <0.5 | 1.6 | 3.7 | 4.4 | 3.4 | <0.5 |
| **CRUSTACEANS** | | | | | | |
| cumaceans | | | | | | |
| *Procampylaspis* sp. | | | | 1 | | |
| *Leucon* sp. | | | | | | 1 |
| **OTHERS** | | | | | | |
| anemone, small | | 1 | 1 | | | |
| sea whip | | | 1 | | | |
| ceriantharian | | | | 1 | | |
| nemerteans | 1 | 1 | 3 | 1 | 1 | |
| sipunculid | | | | 1 | | |
| echiuroid | | | | | 1 | |
| enteropneust | | 1 | | | | |
| leech | | | | | | 1 |

## SAN DIEGO TRENCH, NORTHERN END *(Continued)*

| | | | | | | |
|---|---|---|---|---|---|---|
| Station number | 7404 | 7403 | 7402 | 7396 | 7399 | 7395 |
| Depth in meters | 686 | 734 | 768 | 840 | 844 | 846 |
| Kind of sediment | green mud | green mud, sand | coarse gravel | sand, green mud | sand, green mud | green mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | ← | | (volumes not taken) | | | → |
| Wt. of animals, gms. | <0.5 | 1.6 | 3.7 | 4.4 | 3.4 | <0.5 |
| **NUMBERS OF** | | | | | | |
| **POLYCHAETES** Species | 6 | 7 | 13 | 18 | 8 | 6 |
| Specimens | 7 | 13 | 29 | 84 | 56 | 7 |
| **ECHINODERMS** Species | 0 | 0 | 3 | 3 | 3 | 2 |
| Specimens | 0 | 0 | 7 | 9 | 3 | 2 |
| **MOLLUSKS** Species | 1 | 1 | 5 | 4 | 2 | 3 |
| Specimens | 1 | 1 | 17 | 18 | 4 | 4 |
| **CRUSTACEANS** Species | 0 | 1 | 2 | 4 | 1 | 2 |
| Specimens | 0 | 1 | 2 | 12 | 1 | 3 |
| **OTHERS** Species | 1 | 3 | 3 | 3 | 2 | 1 |
| Specimens | 1 | 3 | 5 | 3 | 2 | 1 |
| **TOTALS** Species | 8 | 12 | 26 | 32 | 16 | 14 |
| Specimens | 9 | 18 | 60 | 126 | 66 | 17 |

## SAN DIEGO TRENCH, NORTHERN END *(Continued)*

| Station number . . . . . | 7404 | 7403 | 7402 | 7396 | 7399 | 7395 |
|---|---|---|---|---|---|---|
| Characteristics of the screenings | siliceous sponge, foraminifers, small animals | foraminifers, small animals | coarse gray gravel, glass sponge, smaller animals | mucoid debris, ophiuroids, other animals | glass sponge, foraminifer shells, animals | glass sponge, foraminifer shells, few animals |
| Largest animal | none | *Glycera*, nemertean | snail fragment | *Ophiura kofoidi* | ophiuroid | none |
| Most abundant or conspicuous species | none | none | none | *Myriochele, Tharyx, Cadulus* | *Myriochele* | none |

# LA JOLLA CANYON

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Amaeana occidentalis* | 4 | 1 | | 1 | | | | | | | |
| *Amage* sp. | 1 | | | | | | | | | | |
| *Ammotrypane aulogaster* | 1 | 2 | | | | | | | | | |
| *Amphicteis scaphobranchiata* | 2 | | | | | | | | | | |
| *Aricidea lopezi* | 310+ | | | 1 | | | | 22 | | | |
| *Aricidea*, nr *suecica* | 2 | | | | | | | | | | |
| *Aricidea uschakowi* | 2 | | | | | | 1 jv | | | 4 | 4 |
| *Ancistrosyllis tentaculata* | 69 | 2 | | | | | | | | ?1 | ?3 |
| *Axiothella* sp. | 20+ | | | | | | | | | | |
| *Brada pilosa* | 5 | | | | | | | | | | |
| *Chloeia pinnata* | 31 jv | 1 jv | 1 jv | 9 | 1 lg | 3 lg | | 5 lg | | 1 jv | |
| *Cossura candida* | 86 | 15 | | 1 | | | | | 1 | 4 sm | 2 sm |
| *Caulleriella* sp. | 2 | | | | | | | | | | |

## LA JOLLA CANYON *(Continued)*

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Drilonereis longa* | 2 | | | | | | | | | | |
| *Drilonereis ?nuda* | 5 | 2 | | | | | | | | | |
| *Eumida* sp. | 4 | | 10 | | | | | | | | |
| *Eunice americana* | 1 | | | | | | | | | | |
| *Glycera americana* | 2 | 1 | | 1 | | | | | | | |
| *Glycera*, other spp. | 30+ | | | 5 jv | 1 jv | | | | | | |
| *Goniada brunnea* | 4 | 4 | 3 | 1 jv | | | | | | | |
| *Haploscoloplos elongatus* | 23 | | 3 jv | 5 jv | 3 | 2 | | | | 6 | 4 |
| *Harmothoë*, nr *lunulata* | 2 | 1 | | | | | | | | | |
| *Harmothoë priops* | 3 | | | | | | | | | | |
| *Isocirrus* sp. | 1 | | | | | | | | | | |
| *Laonice foliata* | 1 | 18 | | | | ?1 | | | | | |
| *Lepidasthenia* sp. | 1 | 4 | | | | | | | | | |

## LA JOLLA CANYON *(Continued)*

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Lumbrineris index* | 1 lg | | | | | | | | | | |
| *Lumbrineris* spp. | 30+ | | | | | | | | 1 | | |
| *Magelona pacifica* | 5 | 1 | | | | | | | | | |
| *Maldane sarsi* | 2 | | | | | | | | | | |
| maldanids, others | some | | | | | | | | | | |
| *Marphysa bellii oculata* | 2 jv | | | | | | | | | | |
| *Mediomastus californiensis* | 45 | 4 | | | | 1 | | | | | |
| *Nephtys ferruginea* | 2 | 5 | | | | | | | | | |
| *Nereis procera* | 43 | 6 | | | | | | | | | |
| *Nerinides pigmentata* | 1 | | | | | | | | | | |
| *Ninoë gemmea* | 1 | 3 | | | | | | | | ?1 | ?12 |
| *Nothria* sp. | 1 | | | | 1 | | | | | | |
| *Notomastus magnus* | 2 lg | | | | | | | | | | |

## LA JOLLA CANYON *(Continued)*

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **POLYCHAETES** *Notomastus tenuis* and spp. | 2 | 2 | | | | | | | | | |
| *Oxydromus a. glabrus* | 6 | 3 | | 1 | 1 jv | | | | | | |
| *Panthalis pacifica* | 2 jv | | | | | | | | | | |
| *Paraonis gracilis* | 35+ | 8 | | | | | | 2 | | | |
| *Pherusa capulata* | 2 jv | 1 | | | | | | | | | |
| *Pholoë glabra* | 6 | 6 | | | | | | | | | |
| *Pilargis berkeleyi* | 2 | 2 | | | | | | | | | |
| *Pilargis maculata* | 3 | 1 | | | | | | | | | |
| *Phyllodoce* sp. | 15 | 4 | | 9 | | | | | | | |
| *Pista* cf. *cristata* | 2 | | | | | | | | | | |
| *Prionospio malmgreni* | 12 | | | 2 jv | | | | | | | |
| *Prionospio pinnata* | 7 | 2 | 2 | 2 | 4 | | | | | | |
| *Rhodine bitorquata* | 1 | | | | | | | | 1 | 5 | |

## LA JOLLA CANYON (Continued)

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Scalibregma inflatum* | 1 | 2 | 3 sm | | | 1 | | | | | |
| *Spiophanes fimbriata* | 14 | | | | 1 jv | | | | | | |
| *Spiophanes missionensis* | 2 | 34 | | | | | | | | | |
| *Scoloplos* sp. | 2 | | | | | | | | | | |
| *Sternaspis fossor* | 46 | 3 | | | | | | | | | |
| *Sthenelanella uniformis* | 3 | | | | | | | | | | |
| *Sthenelais articulata* | 2 | | | | | | | | | | |
| *Telepsavus costarum* | 1 | | | | | | | | | | |
| *Tharyx monilaris* | 2 | 2 | | 2 | | | | | | | 12 |
| *Tharyx tesselata* | 7 | 6 | 10 | 12 | | | | | | 34 | 4 |
| *Aglaophamus dicirris* | | 1 | | | | | | | | | |
| *Asychis disparidentata* | | 1 | | | | | | | | | |
| *Ceratocephala c. americana* | | 2 | | | | | | | | | |

## LA JOLLA CANYON *(Continued)*

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Exogone uniformis* | | 2 | | | | | | | | | |
| *Glycera ?capitata* | | 13 | 23 jv | | | 3 | | | | | 2 jv |
| *Lumbrineris bicirrata* | | 2 | | | | | | | | | |
| *Lumbrineris cruzensis* | | 35 | 13 | 2 | | | | | | | |
| *Myriochele gracilis* or sp. | | 1 | | | | | 1 | | | | 1 |
| *Nothria elegans* | | 1 | | | | | | | | | |
| *Onuphis parva* | | 9 | | | | | | | | | |
| *Paranaitis polynoides* | | 1 | | 2 jv | | | | | | | |
| *Pectinaria californiensis* | | 5 | 206 jv | 195 jv | 774 jv | | | | | | |
| *Peisidice aspera* | | 1 | | 1 | | | | | | | |
| *Pherusa neopapillata* | | 2 | | | | | | | | | |
| *Pista disjuncta* | | 3 | | | | | | | | | |
| *Poecilochaetus johnsoni* | | 6 | | | | | | | | | |

## LA JOLLA CANYON *(Continued)*

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Praxillella a. pacifica* | | 1 | | | | | | | | | |
| *Praxillella gracilis* | | 1 | | | | | | | | | |
| *Prionospio* sp. | | 4 | | | | | | | | | |
| *Sphaerodoridium minutum* | | 1 | | | | | | | | | |
| *Spio punctata* | | 1 | | | | | | | | | |
| syllid | | 1 | | | | | | | | | |
| *Terebellides stroemi* | | 2 | | | | | | | | | |
| *Travisia pupa* | | 1 | | | | | | | | | |
| *Capitella capitata* subspp | | | 595 | 14,145 | 948 | 36 | 1 | 3 | | 5 | |
| *Anaitides* sp. | | 5 | | | | | | | | | |
| *Aphrodita japonica* | | 1 | | | | | | | | | |
| *Platynereis bicanaliculata* | | 12 | | | | | | | | | |
| *Sabellaria* sp. | | 1 | | | | | | | | | |

## LA JOLLA CANYON *(Continued)*

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Eteone*, long headed | | | | 1 | | | | | | | |
| *Glycinde* sp. | | | | 1 jv | | | | | | | |
| *Pareurythoë* sp. | | | | 1 jv | | | | | | | |
| *Aglaophamus* sp. | | | | | 1 | 1 | 2 | | | | |
| harmothoid | | | | | 1 jv | | | | | | |
| *Polydora* sp. | | | | | 1 | | | | | | |
| *Prionospio ?cirrifera* | | | | | 2 | | | | | | |
| spirorbid | | | | | 1 | | | | | | |
| *Ceratonereis paucidentata* | | | | | | 2 | | | | | |
| *Nothria ?iridescens* | | | | | | 1 | | | | | 1 |
| *Ancistrosyllis breviceps* | | | | | | | 1 | | | 3 | |
| *Brada glabra* | | | | | | | 2 | | 4 | 2 | 12 |
| *Califia calida* | | | | | | | 2 lg | | | | |

## LA JOLLA CANYON *(Continued)*

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Leiochrides hemipodus* | | | | | | | 2 | | | 8 | |
| *Lysippe annectens* | | | | | | | 9 | | | 3 | |
| *Maldane cristata* | | | | | | | 6 | | 5 | 8 | 13 |
| *Terebellides,* deep water sp. | | | | | | | 1 | | | 4 | 1 |
| *Glycera ?tesselata* | | | | | | | | 7 | | | |
| *Heteromastus filobranchus* | | | | | | | | 1 lg | | | |
| *Nephtys* sp. | | | | | | | | 15 jv | | | |
| *Phyllochaetopterus limicolus* | | | | | | | | | tubes | 1 | |
| *Chaetozone gracilis* | | | | | | | | | 2 | | 2 |
| *Aricidea ramosa* | | | | | | | | | | 37 | 30 |
| *Glycera c. branchiopoda* | | | | | | | | | | 3 | |
| *Pherusa ?collarifera* | | | | | | | | | | 2 jv | |
| *?Praxillella* sp. | | | | | | | | | | 17 jv | |

## LA JOLLA CANYON *(Continued)*

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Schistocomus* sp. | | | | | | | | | | 3 | |
| *Paraonis gracilis oculata* | | | | | | | | | | 15 | |
| *Laonice* sp. | | | | | | | | | | 1 | |
| *Barantolla* sp. | | | | | | | | | | | 6 |
| *Euclymene* sp. | | | | | | | | | | | 6 |
| *Aricidea (C.) aciculata* | | | | | | | | | | | 3 |
| ampharetid | | | | | | | | | | | 4 sm |
| *Pilargis hamatus* | | | | | | | | | | | ?1 |
| sabellid | | | | | | | | | | | 1 sm |
| **ECHINODERMS** | | | | | | | | | | | |
| *Amphiodia urtica* | 18 | 9 | 1 sm | | | | | | | | |
| *Amphipholis squamata* | 9 | 8 | 24 sm | | | | 1 | | | | |
| *Amphioplus strongyloplax* | | 7 | | | | | | | | | |

## LA JOLLA CANYON *(Continued)*

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **ECHINODERMS** | | | | | | | | | | | |
| *Amphiura arcystata* | | 2 | | | | | | | | | |
| *Ophiura lütkeni* | | | 1 sm | | | | | | | | |
| *Dendraster excentricus* | | | 1 jv | | | | | | | | |
| *Leptosynapta* sp. | | | | 1 | 1 | | | | | | |
| *Amphipholis pugetana* | | | | | | | 1 | | | | |
| *Brissopsis pacifica* | | | | | | | | | | 1 | |
| urchin | | | | | | | | | | 1 sm | |
| *Ophiacantha normani* | | | | | | | | | | | 2 |
| *Ophiura kofoidi* | | | | | | | | | | | 22 |
| **MOLLUSKS** | | | | | | | | | | | |
| small mollusks | pres | | | | | | | | | 45 | |
| *Crystallophrisson* spp. | 1 | | | | | | 3 | | 1 | 12 | 3 |
| *Cadulus* sp. | | | 3 | | | | | | | | |

## LA JOLLA CANYON *(Continued)*

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11 4 |
| **MOLLUSKS** | | | | | | | | | | | |
| *Acteon* | | | 1 | | | | | | | | |
| olive shell | | | 1 | | | | | | | | |
| *Tellina* sp. | | | 1 | | | | | | | | |
| *Saxicavella* sp. | | | 1 | | | | | | | | |
| *Cyclopecten* sp. | | | | 1 | | | | | | | |
| *Erycina* sp. | | | | pres | | | | | | | |
| *Aglaja* sp. | | | | 1 | | | | | | | |
| ?*Modiolus* sp. | | | | 1 | | | | | | | |
| *Rochefortia* sp. | | | | pres | | | | | | | |
| clams, small | | | | | pres | 1 | 6 | pres | 2 | | |
| *Amphissa* sp. | | | | | | 3 | | | | | |
| *Thyasira* sp. | | | | | | 37 | | pres | | | |
| gastropod, small white | | | | | | 4 | | | | | |

## LA JOLLA CANYON *(Continued)*

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **MOLLUSKS** | | | | | | | | | | | |
| *Amygdalum* sp. | | | | | | | 8 | | | | |
| *Dentalium rectius* | | | | | | | ?1 | | | | |
| *Acila castrensis* | | | | | | | | pres | | | |
| caecids | | | | | | | | pres | | | |
| *Solemya* sp. | | | | | | | | pres | 1 | | |
| vermetid | | | | | | | | pres | | | |
| *Mitrella permodesta* | | | | | | | 1 | 10+ | | | |
| **CRUSTACEANS** | | | | | | | | | | | |
| amphipods | | | 8 | 5 | 5 | | | | | 1 | |
| caprellid | | | 2 | | | | | | 1 | | |
| isopod, gnathid | | | 1 jv | | | | | | | | 2 |
| tanaid | | | 1 | | | | | | | | |
| ostracods | | | 2 | | | | | | | | 1 |

## LA JOLLA CANYON *(Continued)*

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **CRUSTACEANS** | | | | | | | | | | | |
| cumaceans | | | | | | | | | | | |
| *Cumella* sp., heavily dentate | | 1 | | | | | | | | | |
| *Diastylis*, nr *stygia* | | 2 | 1 | | | | | | | | |
| *Eudorellopsis longirostris* | | 1 | | | | | | | | | |
| *Leucon*, nr *subnasica* | | 2 | | | | | | | | | 7 |
| *Diastylis pellucida* | | | | 3 | 4 | | | | | | |
| *Leptostylis*, nr *villosa* | | | | | 2 | | | | | | |
| *Campylaspis* sp., deeply sculptured | | | | | | | | | | 1 | |
| *Eudorella pacifica* | | | | | | | | | | 1 | |
| *Makrokylindrus* sp. | | | | | | | | | | | 1 |
| nebalian | | | | 1 | | | | | | | |
| *Monstrilla*, copepod | | | | 144 | | | | | | | |
| harpacticoid, copepod | | | | | | 10+ | | | | | |

## LA JOLLA CANYON *(Continued)*

| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **CRUSTACEANS** | | | | | | | | | | | |
| shrimp | | | 1 | | | | | | | | |
| **OTHERS** | | | | | | | | | | | |
| ?*Harenactis* sp. | 9+ | | | | | | | | | | |
| hydroid | | | | | | 1 | | | | | |
| sea whip, loose pannicled | | | | | | | 1 | | | | |
| anemones | | | | | | | | | 1 | 4 | 1 |
| nemerteans | 25+ | | 1 | | | | | | 3 | 2 | 1 |
| *Cerebratulus* sp. | 1 lg | | | 1 | | | | | | | |
| echiuroids, 2 spp. | | | | | | | | 5 | | | |
| sipunculid | | | | | | | | | | | 3 |
| enteropneusts | 10 | | | | | | | | | 2 | |
| *Siboglinum*, 2 spp. | | | | | | | | | | | 50+ |
| (siliceous sponge) | | | | | | | | | much | | trace |

## LA JOLLA CANYON *(Continued)*

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station number | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
| Depth in meters | 79 | 121 | 135 | 274 | 371 | 517 | 545 | 637 | 708 | 793 | 976 |
| Kind of sediment | sand | silt, mud | sand, pebbles | sand | silt, sand | sand, mud | mud | sand | mud | mud, sand | sand, mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 2.58 | 3.94 | 1.0 | 0.49 | 0.26 | 1.21 | 5.59 | 3.3 | 5.74 | 1.07 | 2.51 |
| Wt. of animals, gms. | 17.5 | 81.8 | 1.5 | 36.9 | 4.8 | 5.0 | 11.2 | 5.2 | negl. | 2.7 | 11.4 |
| **NUMBERS OF** | | | | | | | | | | | |
| **POLYCHAETES** Species | 62 | 54 | 15 | 19 | 14 | 11 | 11 | 7 | 8 | 21 | 21 |
| Specimens | 925 | 242 | 888 | 14,400 | 828 | 17 | 30 | 20 | 162 | 162 | 133 |
| **ECHINODERMS** Species | 2 | 4 | 4 | 1 | 1 | 0 | 2 | 0 | 0 | 2 | 2 |
| Specimens | 27 | 26 | 27 | 1 | 1 | 0 | 2 | 0 | 0 | 2 | 24 |
| **MOLLUSKS** Species | 2+ | .. | 5 | 5 | 2 | 4 | 5 | 7+ | 4 | 2 | 1 |
| Specimens | 2+ | | 7 | 5+ | 6+ | 45 | 19 | 16+ | 5 | 57 | 3 |
| **CRUSTACEANS** Species | 0 | 6 | 7 | 4 | 2 | 1 | 2 | 0 | 1 | 3 | 4 |
| Specimens | 0 | 16 | 15 | 155 | 10 | 10+ | 2 | 0 | 1 | 3 | 6 |
| **OTHERS** Species | 4 | .. | 1 | 1 | 0 | 0 | 2 | 2 | 2 | 4 | 5 |
| Specimens | 45 | | 1 | 1 | 0 | 0 | 2 | 5 | 4 | 8 | 55+ |
| **TOTALS** Species | 70+ | 64 | 32 | 30 | 19 | 16 | 22 | 16+ | 15 | 32 | 33 |
| Specimens | 999+ | 284 | 938 | 14,562+ | 845+ | 72+ | 55 | 41+ | 172 | 232 | 221+ |

## LA JOLLA CANYON *(Continued)*

| Station number . . . . . | 7044 | 7038 | 7043 | 7045 | 7039 | 7046 | 7041 | 7040 | 7048 | 7047 | 7049 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Characteristics of the screenings | fibrous debris, worm tubes | rock debris, dead shells, tubes of worms | gray sand, worms, plant debris | worms with plant debris | woody fragments, worms | plant debric, worms, small shells | silty debris, tubes, animals | woody debris, plant debris, small animals | siliceous sponge, small worms, white foraminifer tests | fine debris with foraminifer tests, worms | fibrous tubes, pogonophorans, worm-like animals |
| Largest specimen | *Cerebratulus* | *Aphrodita, Asychis disparidentata* | none | none | *Prionospio pinnata* | none | *Brissopsis pacifica* | echiuroid worm | none | *Maldane cristata* | *Ophiacantha normani* |
| Most abundant or conspicuous species | *Cossura, Ancistrosyllis, Sternaspis* | *Lumbrineris cruzensis, Spiophanes* | *Capitella, Pectinaria* | *Capitella* | *Capitella, Pectinaria* | *Thyasira, Capitella* | *Amygdalum* | small clams, *Aricidea* | *Maldane cristata* . | *Aricidea ramosa, Tharyx* | *Siboglinum, Aricidea ramosa, Ophiura kofoidi* |

## CORONADO CANYON

| Station number | 6846 | 6845 | 6849 | 6852 | 6851 | 6850 | 6844 | 6842 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 123 | 177 | 344 | 566 | 812 | 960 | 1105 | 1265 |
| Kind of sediment | sand | sand | mud | mud | mud | mud | mud, sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.71 | 2.44 | 5.74 | 0.6 | 5.52 | 3.87 | 4.66 | 5.23 |
| Wt. of animals, gms. | 15.4 | 21.1 | 22.9 | 54.5 | 3.8 | 105.7 | 2.4 | 11.8 |
| **POLYCHAETES** | | | | | | | | |
| *Amaeana occidentalis* | 1 | | | | | | | |
| ampharetids | 3 jv | | | 12 lg | 5 | | | |
| *Aricidea*, nr *suecica* | 6 | | | | | | | |
| *Axiothella* sp. | 3 | 2 | | | | | | |
| *Brada glabra* | 1 | 1 | | 2 | | 5 | | |
| *Brada pluribranchiata* | 2 | | | | | | | |
| *Chone ?gracilis* | 1 | | | | | | | |
| *Cossura candida* | 1 | 1 | | | | | | |
| *Driloncreis ?nuda* | 2 jv | 3 | | | 1 lg | | | |
| *Eunice americana* | 1 jv | 1 jv | 1 | | | | | |
| *Glycera capitata* | 6 | 17 jv | | | 1 jv | | | ?1 |
| *Goniada littorea* | 1 | | | | | | | |
| *Harmothoë*, nr *lunulata* | 3 | 1 | | | | | | |

## CORONADO CANYON *(Continued)*

| Station number | 6846 | 6845 | 6849 | 6852 | 6851 | 6850 | 6844 | 6842 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 123 | 177 | 344 | 566 | 812 | 960 | 1105 | 1265 |
| Kind of sediment | sand | sand | mud | mud | mud | mud | mud, sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.71 | 2.44 | 5.74 | 0.6 | 5.52 | 3.87 | 4.66 | 5.23 |
| Wt. of animals, gms. | 15.4 | 21.1 | 22.9 | 54.5 | 3.8 | 105.7 | 2.4 | 11.8 |
| **POLYCHAETES** | | | | | | | | |
| *Lumbrineris cruzensis* | 6 | 17 | | | | | | |
| maldanids | 2 jv | | | | | | | |
| *Mediomastus californiensis* | 3 | | | | | | | |
| *Melinna* sp. | 1 jv | | | | | | | |
| *Myriochele gracilis* | 2 | 7 | | 1 sm | | | | 1 |
| *Nephtys ferruginea* | 4 jv | 9 | 3 | 3 sm | | | | |
| *Onuphis parva* | 4 | | | | | | | |
| *Oxydromus a. glabrus* | 2 | | | | | | | |
| *Owenia* sp. | 2 | | | | | | | |
| *Panthalis pacifica* | 1 | | | | | | | |
| *Pectinaria californiensis* | 15 | 17 | 3 | | | | | |
| *Pherusa capulata* | 1 | | | | | | | |
| *Pherusa neopapillata* | 1 | | | 1 | | | | |

## CORONADO CANYON *(Continued)*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Station number | 6846 | 6845 | 6849 | 6852 | 6851 | 6850 | 6844 | 6842 |
| Depth in meters | 123 | 177 | 344 | 566 | 812 | 960 | 1105 | 1265 |
| Kind of sediment | sand | sand | mud | mud | mud | mud | mud, sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.71 | 2.44 | 5.74 | 0.6 | 5.52 | 3.87 | 4.66 | 5.23 |
| Wt. of animals, gms. | 15.4 | 21.1 | 22.9 | 54.5 | 3.8 | 105.7 | 2.4 | 11.8 |
| **POLYCHAETES** | | | | | | | | |
| *Pista disjuncta* | 1 jv | | | | | | | |
| *Pholoë glabra* | 7 | 5 | | | | | | |
| *Prionospio pinnata* | 1 jv | 2 | 3 | | | | | |
| *Prionospio*, other spp. | 6 jv | 1 | | | | | | |
| *Sphaerodoridium minutum* | 1 | 2 | | | | | | |
| *Spiophanes missionensis* | 2 | 100+ | | | | | | |
| *Sthenelanella uniformis* | 1 | | | | | | | |
| syllid | 2 | | | | | | | |
| *Sternaspis fossor* | 3 | 5 | 2 | | 2 | | | |
| *Tharyx monilaris* | 6 | 5 | | | | | | |
| *Tharyx tesselata* | 5 | 5 | | | ?2 | 1 lg | 3 | 1 |
| *Travisia pupa* | 2 | | | | | | | |
| *Aglaophamus erectans* | | 1 | 1 | | | | | |

## CORONADO CANYON *(Continued)*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Station number | 6846 | 6845 | 6849 | 6852 | 6851 | 6850 | 6844 | 6842 |
| Depth in meters | 123 | 177 | 344 | 566 | 812 | 960 | 1105 | 1265 |
| Kind of sediment | sand | sand | mud | mud | mud | mud | mud, sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.71 | 2.44 | 5.74 | 0.6 | 5.52 | 3.87 | 4.66 | 5.23 |
| Wt. of animals, gms. | 15.4 | 21.1 | 22.9 | 54.5 | 3.8 | 105.7 | 2.4 | 11.8 |
| **POLYCHAETES** | | | | | | | | |
| *Amage* sp. | | 3 | | | | | | |
| *Ammotrypane aulogaster* | | 5 | | | | | | |
| *Amphicteis* sp. | | 1 frg | | | | | | |
| *Ceratocephala c. americana* | | 1 | | | | | | |
| *Chloeia pinnata* | | 3 | | | | | | |
| *Glycera robusta* | | 1 very lg | | | | | | |
| *Goniada brunnea* | | 2 | 2 | | 1 | | 1 | 1 lg |
| *Laonice foliata* | | 4 | | | | | | |
| *Lumbrineris bicirrata* | | 1 | | | | | | |
| *Maldane* spp. | | 1 jv | | | 6 | 18 | 1 jv | 1 |
| *Nereis procera* | | 2 | | | | | | |
| *Nothria* sp. | | 9 jv | | | | | | |
| *Notomastus* sp. | | 3 jv | | | | | | |

## CORONADO CANYON *(Continued)*

| Station number | 6846 | 6845 | 6849 | 6852 | 6851 | 6850 | 6844 | 6842 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 123 | 177 | 344 | 566 | 812 | 960 | 1105 | 1265 |
| Kind of sediment | sand | sand | mud | mud | mud | mud | mud, sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.71 | 2.44 | 5.74 | 0.6 | 5.52 | 3.87 | 4.66 | 5.23 |
| Wt. of animals, gms. | 15.4 | 21.1 | 22.9 | 54.5 | 3.8 | 105.7 | 2.4 | 11.8 |
| **POLYCHAETES** | | | | | | | | |
| *Paraonis gracilis* | | 4 | | | | 1 | | |
| *Phyllochaetopterus limicolus* | | 1 | | | | | | |
| *Polydora* sp. | | 1 jv | | | | | | |
| *Praxillella a. pacifica* | | 2 | | | | | | |
| *Pherusa papillata* | | 1 jv | | | | | | |
| *Sthenelais tertiaglabra* | | 1 | | | | | | |
| *Terebellides stroemi* | | 16 | | | | | | |
| *Typosyllis* sp. | | 1 | | | | | | |
| *Amphicteis scaphobranchiata* | | | 3 | | | | 2 | |
| *Ancistrosyllis breviceps* | | | 3 | 2 | | | | |
| *Dorvillea atlantica* subsp. | | | 7 | | | | | |
| *Haploscoloplos elongatus* | | | 1 | | 3 | 2 | | |
| *Melinna heterodonta* | | | 36 lg | 6 | 1 lg | | | |

## CORONADO CANYON *(Continued)*

| Station number | 6846 | 6845 | 6849 | 6852 | 6851 | 6850 | 6844 | 6842 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 123 | 177 | 344 | 566 | 812 | 960 | 1105 | 1265 |
| Kind of sediment | sand | sand | mud | mud | mud | mud | mud, sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.71 | 2.44 | 5.74 | 0.6 | 5.52 | 3.87 | 4.66 | 5.23 |
| Wt. of animals, gms. | 15.4 | 21.1 | 22.9 | 54.5 | 3.8 | 105.7 | 2.4 | 11.8 |
| **POLYCHAETES** | | | | | | | | |
| *Nothria iridescens* | | | 24 | | | | | |
| *Anobothrus* sp. | | | | 100+ | | | | 1 |
| *Brada pilosa* | | | | 63+ | ?1 | | | |
| *Leiochrides hemipodus* | | | | 3 | | | | |
| *Notomastus magnus* | | | | 8 | | 4 | | |
| *Notomastus* spp. | | | | 8 | 4 | | | |
| *Phylo nudus* | | | | 1 lg | | | | |
| *Pista* sp. | | | | 2 sm | | | | |
| *Sphaerosyllis* sp. | | | | 1 | | | | |
| *Aricidea uschakowi* | | | | | 1 | | | 1 |
| *Chaetozone ?spinosa* | | | | | 4 | | | |
| *Leanira alba* | | | | | 1 | | | |
| *Lumbrineris* sp. | | | | | 5 sm | | | |

## CORONADO CANYON *(Continued)*

| Station number | 6846 | 6845 | 6849 | 6852 | 6851 | 6850 | 6844 | 6842 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 123 | 177 | 344 | 566 | 812 | 960 | 1105 | 1265 |
| Kind of sediment | sand | sand | mud | mud | mud | mud | mud, sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.71 | 2.44 | 5.74 | 0.6 | 5.52 | 3.87 | 4.66 | 5.23 |
| Wt. of animals, gms. | 15.4 | 21.1 | 22.9 | 54.5 | 3.8 | 105.7 | 2.4 | 11.8 |
| **POLYCHAETES** | | | | | | | | |
| *Ninoë gemmea* | | | | | 15 | 1 | 1 | |
| *Onuphis vexillaria* | | | | | 1 | | | |
| *Paraonis gracilis oculata* | | | | | 2 | | | |
| *Pholoë* sp., *anoculate* | | | | | 1 | | | |
| *Rhodine bitorquata* | | | | | 1 | 8 | | |
| *Praxillella* sp. | | | | | 10 | | | |
| *Sphaerodorum* sp. | | | | | 1 | | | |
| polychaete, unknown fam. | | | | | 1 | | | |
| *Euclymene ?reticulata* | | | | | | 3 | | |
| *Notomastus precocis* | | | | | | 14 | | 1 |
| *Califia ?calida* | | | | | | | 2 | 1 |
| *Drilonereis*, nr *longa* | | | | | | | 2 | ?1 |
| *Lumbrineris limicola* | | | | | | | 1 | |

## CORONADO CANYON *(Continued)*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Station number | 6846 | 6845 | 6849 | 6852 | 6851 | 6850 | 6844 | 6842 |
| Depth in meters | 123 | 177 | 344 | 566 | 812 | 960 | 1105 | 1265 |
| Kind of sediment | sand | sand | mud | mud | mud | mud | mud, sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.71 | 2.44 | 5.74 | 0.6 | 5.52 | 3.87 | 4.66 | 5.23 |
| Wt. of animals, gms. | 15.4 | 21.1 | 22.9 | 54.5 | 3.8 | 105.7 | 2.4 | 11.8 |
| **POLYCHAETES** | | | | | | | | |
| *Nothria pallida* | | | | | | | 3 | |
| *Praxillella trifila* | | | | | | | 2 | |
| *Spiophanes pallidus* | | | | | | | 1 | 1 |
| *Aglaophamus* sp. | | | | | | | | 1 jv |
| *Asychis*, nr *gotoi* | | | | | | | | 1 lg |
| *Asychis*, another sp. | | | | | | | | 1 sm |
| *Lumbrineris longensis* | | | | | | | | ?1 |
| *Lumbriclymene* sp. | | | | | | | | 1 |
| **ECHINODERMS** | | | | | | | | |
| *Amphiacantha amphacantha* | 24 | 6 | | | | | | |
| *Amphiodia urtica* | 85 | 107 | | | | | | |
| *Amphipholis squamata* | 22 | 54 | | 4 sm | | | | |
| *Amphiura arcystata* | 4 | | | | | | | |

## CORONADO CANYON *(Continued)*

| Station number | 6846 | 6845 | 6849 | 6852 | 6851 | 6850 | 6844 | 6842 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 123 | 177 | 344 | 566 | 812 | 960 | 1105 | 1265 |
| Kind of sediment | sand | sand | mud | mud | mud | mud | mud, sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.71 | 2.44 | 5.74 | 0.6 | 5.52 | 3.87 | 4.66 | 5.23 |
| Wt. of animals, gms. | 15.4 | 21.1 | 22.9 | 54.5 | 3.8 | 105.7 | 2.4 | 11.8 |
| **ECHINODERMS** | | | | | | | | |
| *Ophiura lütkeni* | 2 | | | | | | | 1 |
| *Leptosynapta albicans* | 16 | | 2 | | | | | |
| *Pentamera pseudopopulifera* | 2 | | | | | | | |
| *Amphioplus strongyloplax* | | 1 | 2 | | | | | |
| *Brissopsis pacifica* | | 1 jv | 2 | 2 lg | | 6 | | |
| *Molpadia intermedia* | | 1 | | | | | | |
| *Ophiacantha normani* | | | | | 2 | | 8 sm | |
| *Ophiura leptoctenia* | | | | | | | 4 sm | |
| *Ophiomusium lymani* | | | | | | 1 sm | | 1 |
| **MOLLUSKS** | | | | | | | | |
| *Acila* sp. | pres | pres | | | | | | |
| *Amygdalum pallidulum* | pres | pres | | | | | | |
| *Bittium* sp. | pres | pres | | | | | | |

## CORONADO CANYON *(Continued)*

| Station number | 6846 | 6845 | 6849 | 6852 | 6851 | 6850 | 6844 | 6842 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 123 | 177 | 344 | 566 | 812 | 960 | 1105 | 1265 |
| Kind of sediment | sand | sand | mud | mud | mud | mud | mud, sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.71 | 2.44 | 5.74 | 0.6 | 5.52 | 3.87 | 4.66 | 5.23 |
| Wt. of animals, gms. | 15.4 | 21.1 | 22.9 | 54.5 | 3.8 | 105.7 | 2.4 | 11.8 |
| **MOLLUSKS** | | | | | | | | |
| *Cadulus* sp. | pres | pres | 1 | | | | 1 | |
| *Cardita* sp. | | pres | | | | | | |
| *Cuspidaria* sp. | pres | pres | | | | | | |
| *Dentalium rectius* | | pres | 1 | | | | 1 | 1 |
| *Tellina* sp. | pres | pres | | | | | | |
| *Crystallophrisson* sp. | 1 | 1 | | 8 | | 1 | 3 | 1 |
| *Prochaetoderma* | | 1 | | 36 | | 7 | | |
| *Mitrella carinata* | | 1 | | | | | | |
| *Cylichnella* sp. | | 1 | | 3 | | | | |
| *Dacrydium pacificum* | | | | 1 | | | | |
| *Lyonsiella alaskana* | | | | 3 | | | | |
| *Thyasira* sp. | | pres | | | | | | |
| clam, small white | | | 2 | 2 | | | | |

## CORONADO CANYON *(Continued)*

| Station number | 6846 | 6845 | 6849 | 6852 | 6851 | 6850 | 6844 | 6842 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 123 | 177 | 344 | 566 | 812 | 960 | 1105 | 1265 |
| Kind of sediment | sand | sand | mud | mud | mud | mud | mud, sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.71 | 2.44 | 5.74 | 0.6 | 5.52 | 3.87 | 4.66 | 5.23 |
| Wt. of animals, gms. | 15.4 | 21.1 | 22.9 | 54.5 | 3.8 | 105.7 | 2.4 | 11.8 |
| **CRUSTACEANS** | | | | | | | | |
| amphipods | 62 | ca 40 | 29 | 9 | 10 | 1 | 1 | 1 |
| caprellid | | | | 5 | | | | |
| isopods | | | | 1 | | | | |
| anthurid | 2 | 2 | | | | | | |
| *Gnathia* | | 1 | 1 | | | | | |
| tanaid | 4 | 2 | 1 | 1 | | | | 1 |
| cumaceans | | | | | | | | |
| *Diastylis*, nr *stygia* | 1 | 4 | | | | | | |
| *Eudorellopsis longirostris* | 5 | | | | | | | |
| *Leucon* sp., laterally armed | | | 1 | | 1 | | | |
| ostracods | | 17 | | | | | | |
| brown | 6 | | | | | | | |
| rectangular | 8 | | 2 | | | | | |

## CORONADO CANYON *(Continued)*

| Station number | 6846 | 6845 | 6849 | 6852 | 6851 | 6850 | 6844 | 6842 |
|---|---|---|---|---|---|---|---|---|
| Depth in meters | 123 | 177 | 344 | 566 | 812 | 960 | 1105 | 1265 |
| Kind of sediment | sand | sand | mud | mud | mud | mud | mud, sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.71 | 2.44 | 5.74 | 0.6 | 5.52 | 3.87 | 4.66 | 5.23 |
| Wt. of animals, gms. | 15.4 | 21.1 | 22.9 | 54.5 | 3.8 | 105.7 | 2.4 | 11.8 |
| **CRUSTACEANS** | | | | | | | | |
| ridged | 1 | | | | | | | |
| pinnixid crab | 1 | | | | | | | |
| pagurid crab | | 1 sm | | | | | | |
| **OTHERS** | | | | | | | | |
| *Monobrachium* sp., colonies | 3 | 1 | | | | | | |
| nemerteans | 6 | 3 | 3 lg | 5 | | 10 | | |
| enteropneust | 1 | | | | | | | |
| polyclad | | 1 | | | | | | |
| sipunculids | | 2 sm | | 26 | | 2 | | |
| *Siboglinum* spp. | | | | 1+ | 25+ | | 4+ | 20+ |
| anemone | | | | | 1 sm | | | |
| ?*Golfingia* sp. | | | | | 1 | | 6 | 1 |
| oligochaete | | | | | | 2 | | |

## CORONADO CANYON *(Continued)*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Station number | 6846 | 6845 | 6849 | 6852 | 6851 | 6850 | 6844 | 6842 |
| Depth in meters | 123 | 177 | 344 | 566 | 812 | 960 | 1105 | 1265 |
| Kind of sediment | sand | sand | mud | mud | mud | mud | mud, sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.71 | 2.44 | 5.74 | 0.6 | 5.52 | 3.87 | 4.66 | 5.23 |
| Wt. of animals, gms. | 15.4 | 21.1 | 22.9 | 54.5 | 3.8 | 105.7 | 2.4 | 11.8 |
| **NUMBERS OF** | | | | | | | | |
| **POLYCHAETES** | | | | | | | | |
| Species | 38 | 41 | 13 | 16 | 23 | 11 | 11 | 17 |
| Specimens | 112 | 265 | 87 | 215 | 70 | 58 | 19 | 17 |
| **ECHINODERMS** | | | | | | | | |
| Species | 7 | 6 | 3 | 2 | 1 | 2 | 2 | 2 |
| Specimens | 134 | 170 | 5 | 6 | 2 | 7 | 12 | 2 |
| **MOLLUSKS** | | | | | | | | |
| Species | 7 | 12 | 3 | 6 | 0 | 2 | 3 | 2 |
| Specimens | .. | .. | 4 | 53 | 0 | 8 | 5 | 2 |
| **CRUSTACEANS** | | | | | | | | |
| Species | 9+ | 7+ | 5+ | 4 | 2+ | 1 | 1 | 2 |
| Specimens | 90 | 66 | 34 | 17 | 10 | 1 | 1 | 2 |
| **OTHERS** | | | | | | | | |
| Species | 3 | 4 | 1 | 3+ | 3+ | 3 | 20 | 2 |
| Specimens | 10 | 7 | 3 | 32+ | 27+ | 14 | 10+ | 21+ |
| **TOTALS** | | | | | | | | |
| Species | 64+ | 70+ | 25+ | 31+ | 29+ | 19 | 19+ | 25 |
| Specimens | 346 | 508 | 133 | 323+ | 109+ | 88 | 47+ | 44+ |

## CORONADO CANYON *(Continued)*

<table>
<tr><th>Station number . . . . .</th><th>6846</th><th>6845</th><th>6849</th><th>6852</th><th>6851</th><th>6850</th><th>6844</th><th>6842</th></tr>
<tr><td>Characteristics of the screenings</td><td>sand, silt, ophiuroids, worms</td><td colspan="2">dead shells of Acila, Cardita, Lucinoma, Thyasira and other mollusks; also ophiuroids and worms</td><td>flocculent debris, brissopsids, worms</td><td>dead broken gastropod shells, silt with worms</td><td>silt, foraminifer tests, brissopsids, worms</td><td>siliceous sponge, tubes of Siboglinum</td><td>silt with tubes and worms</td></tr>
<tr><td>Largest species</td><td>Ophiura lütkeni</td><td>Glycera robusta</td><td>Brissopsis pacifica</td><td>Brissopsis pacifica</td><td>Melinna</td><td>Brissopsis pacifica</td><td>none</td><td>Asychis</td></tr>
<tr><td>Most abundant or conspicuous species</td><td>Amphiodia urtica</td><td>Amphiodia urtica, Spiophanes, Pectinaria</td><td>Melinna heterodonta, Nothria</td><td>Anobothrus, solenogasters</td><td>Siboglinum, Ninoë</td><td>Maldane, Notomastus</td><td>Ophiacantha</td><td>Siboglinum</td></tr>
</table>

## SANTA CRUZ CANYON

| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **POLYCHAETES** | | | | | | | | | | |
| *?Ammotrypane aulogaster* | 2 | | | | | | | | | |
| *Anobothrus gracilis* | 10 | | | | | | ca 50 | | | |
| *Aricidea furcata* | 4 | | | | | | | | | |
| *Aricidea lopezi* | 3 | | | 3 | | | | | | |
| *Aricidea uschakowi* | 3 | | | | | | | | 1 | |
| *Anaitides*, sp. | 1 jv | | | 2 | | | | | | |
| *Chaetozone*, nr. *spinosa* | 1 frg | | 4 | | | | | | | |
| *Chone* sp. | 8 | | | | | | | | | |
| *Driloncreis ?nuda* | 6 | | | | | | | | | |
| *Eteone* sp. | 1 | | | | | | | | | |
| *?Euchone* sp. | 1 frg | | | | | | | | | |
| *Eunice americana* | 1 | | | | | | | | | |
| *Glycera oxycephala* | 4 | | | | | | | | | |

## SANTA CRUZ CANYON *(Continued)*

| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **POLYCHAETES** | | | | | | | | | | |
| *Harmothoë ?scriptoria* | 3 | | | | | | | | | |
| *Lanice* sp. | 1+ | | | 2+ | | | | | | |
| *Lumbrineris acuta* | 3 | | | | | | | | | |
| *Lumbrineris* spp. | 8 frg | | | | | 1+ | | | | |
| *Magelona californica* | 2 | | | | | | | | | |
| *Myriowenia californiensis* | 1 | | | | | | | | | |
| *Myriochele gracilis* | 2 | | | | | | | | | |
| *Naineris uncinata* | 1 | 1 | 4 | | | | | | | |
| *Nereis procera* | 1 | | | | | | | | | |
| *Notomastus ?lineatus* | 1 frg | 3 | 8 | | | | | | | |
| *Onuphis nebulosa* | 6 | | | | | | | | | |
| onuphid | 248 jv | | | | | | | | | |
| *Odontosyllis phosphorea* | 2 | ?1 | | | | | | | | |

## SANTA CRUZ CANYON *(Continued)*

| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **POLYCHAETES** | | | | | | | | | | |
| *Odontosyllis*, another sp. | 1 | | | | | | | | | |
| *Owenia* sp. | 1 | | 1 | | | | | | | |
| *Paraonis gracilis* | 1 | | | | | | | 2 | | |
| *Pholoë glabra* | 5 | | | | | | | | | |
| *Phyllochaetopterus prolifica* | 1 | | | | | | | | | |
| ?*Praxillella a. pacifica* | 1 | | | | | | | | | |
| *Prionospio malmgreni* | 2 | | | | | | | | | |
| *Prionospio pinnata* | 2 | | | | | | | | | |
| *Rhamphobrachium longisetosum* | 2 | | | | | | | | | |
| *Scalibregma inflatum* or sp. | 1 frg | | 3 jv | 7 | 1 | | | | | |
| *Schistocomus* sp. | 2 | | | | | | | | | |
| ?*Spio punctata* | 9 | | | | | | | | | |
| *Spiophanes bombyx* | 1 | | | | | | | | | |

## SANTA CRUZ CANYON *(Continued)*

| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **POLYCHAETES** | | | | | | | | | | |
| *Spiophanes ?missionensis* | 7 | | | | | | | | | |
| *Sthenelanella uniformis* | 3 | | | | | | | | | |
| *Telepsavus costarum* | 2 | | | | | | | | | |
| *Thalenessa spinosa* | 2 | | | | | | | | | |
| *Tharyx tesselata* | 7+ | | 2 | 20 | | 2 | | | | |
| *Amage anops* | | 1 | | | | | | | | |
| *Brada pilosa* | | 1 | | | 2 | | | | | |
| *Amphicteis scaphobranchiata* | | 2 | | | | | | | | |
| *Dodecaceria* sp. | | 1 jv | | | | | | | | |
| *Eumida* sp. | | 1 | 1 | | | | | | | |
| *Euphrosine* sp. | | 2 | | | | | | | | |
| *Glycera tesselata* | | 14 | | | | | | | | |
| *Lepidasthenia* sp. | | 3 | 4 | 1 | 1 frg | | | | | |

## SANTA CRUZ CANYON *(Continued)*

| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **POLYCHAETES** | | | | | | | | | | |
| *Lepidonotus caelorus* | | 10 | 2 | 6 | | | | | | |
| *Laonice foliata* or spp. | | 1 | | 22 | | | | | | |
| *Lumbrineris cruzensis* | | 2 | ?3 | 33 | | | | | | |
| *Maldanella* sp. | | 3 | | | | | | | | |
| ?*Melinnexis* sp. | | 1 | | | | | | | | |
| *Nicomache* sp. | | 1- | | | | | | | | |
| *Pectinaria californiensis* | | 1 | | | | | | | | |
| *Peisidice aspera* | | 13 | 8 | | | | | | | |
| *Phyllodoce* sp. | | 1 | | | | | | | | |
| *Pholoë* sp. | | 1 | 1 | | | | | | | |
| *Polydora* sp. | | 1 | | 2 jv | | | | | | |
| sabellid | | 2 jv | | | | | | | | |
| syllid | | 1 | | | | | | | | |

## SANTA CRUZ CANYON *(Continued)*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **POLYCHAETES** | | | | | | | | | | |
| *Streblosoma crassibranchia* | | ?2 | | | | | | | | |
| *Terebellides* sp. | | 1 sm | 1 | | | | | | | |
| *Ampharete* sp. | | | 4 | | | | | | | |
| *Axiothella* sp. | | | ?1 | | | | | | | |
| *Drilonereis* sp. | | | 1 jv | | | | | | | |
| *Glycera americana* | | | 13 | 3 | | | | | | |
| *Goniada* sp. | | | 1 | | | | | | | |
| *Laonice* sp. | | | 1 jv | | | | | | | |
| *Lumbrineris bicirrata* | | | 1 | | | | | | | |
| *Lysippe annectens* | | | 1 | | | | | | | |
| *Nephtys* sp. | | | 2 jv | | | | | | | |
| *Pherusa capulata* | | | 1 | | | | | | | |
| *Plakosyllis americana* | | | 1 | | | | | | | |

## SANTA CRUZ CANYON *(Continued)*

| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **POLYCHAETES** | | | | | | | | | | |
| *Prionospio* sp. | | | 3 jv | | | | | | | |
| *Thelepus* sp. | | | 4 | | | | | | | |
| *Chaetozone* spp. | | | | 244 | | | | 2 | | |
| *Glycera ?capitata* | | | | 1 | | | | | | |
| *Lumbrineris index* | | | | 3 | | | | | | |
| maldanids | | | | 14 | 6 frg | | | | | |
| *Notomastus* sp. | | | | 3 | | | | | | |
| *Myriochele* sp. | | | | | 3 jv | 6 | 2 jv | | | |
| ?*Typosyllis* sp. | | | | | 1 | | | | | |
| *Aricidea (Aedicira)*, unknown sp. | | | | | 6 | | | | | |
| *Aricidea (Aricidea)* sp. | | | | | 2 | | | | | |
| *Clymenopsis cingulata* | | | | | 3 | | | | | |
| ?*Flabelligera*, unknown sp. | | | | | 1 frg | | | | | |

## SANTA CRUZ CANYON *(Continued)*

| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **POLYCHAETES** | | | | | | | | | | |
| nephtyid | | | | | 2 jv | | | | | |
| *Polydora* cf. *caulleryi* | | | | | 2 jv | | | | | |
| *Scoloplos ?acmeceps* | | | | | 1 jv | | | | | |
| *Spiophanes fimbriata* or sp. | | | | | 1 jv | | | | | 2 |
| terebellid | | | | | 1 frg | | | | | |
| *Tharyx ?monilaris* | | | | | 1 frg | 1 | 1 | 3 | ?1 | |
| *Aricidea lopezi rubra* | | | | | | 10 | | | | |
| *Cossura candida* or sp. | | | | | | 1 | 1 | 1 sm | 1 | |
| *Lysippe* sp. | | | | | | 3 | | | | |
| *Paraonis* sp. | | | | | | 5 | | | | |
| *Pherusa ?collarifera* | | | | | | 1 frg | | 1 frg | | |
| *Terebellides stroemi* | | | | | | 3 | | | | |
| *Nothria* sp. | | | | | | 1+ | | | | |

## SANTA CRUZ CANYON *(Continued)*

| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **POLYCHAETES** | | | | | | | | | | |
| polynoid | | | | | | 1+ | | | | |
| polychaete, unknown | | | | | | 1 | | | | |
| *Melinnexis* sp. | | | | | | | 1 | | | |
| *Ammotrypane pallida* | | | | | | | 1 | | | |
| *Notomastus* sp. | | | | | | | 1 lg | | | |
| *Antinoella anoculata* | | | | | | | | 3 | | |
| *Haploscoloplos elongatus* | | | | | | | | 8 | | |
| *Leiochrides hemipodus* | | | | | | | | 25 | | |
| ampharetids | | | | | | | | 7 jv | | |
| *Notomastus ?magnus* | | | | | | | | 1 frg | | |
| *Rhodine bitorquata* or sp. | | | | | | | | 1 | 2 | |
| *Sternaspis ?fossor* | | | | | | | | 16 | | |
| *Phyllochaetopterus limicolus* | | | | | | | | tubes | 1 | tubes |

## SANTA CRUZ CANYON *(Continued)*

| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **POLYCHAETES** | | | | | | | | | | |
| *?Euclymene* sp. | | | | | | | | | 1 frg | |
| *Ninoë gemmea* | | | | | | | | | 2 | |
| *Nereis anoculis* | | | | | | | | | 1 | |
| **ECHINODERMS** | | | | | | | | | | |
| *Amphiodia urtica* | 16 | | | 2 | 1 | | | | | |
| *Amphipholis pugetana* | 4 | 10 | 2 | 95 | | 1 | | | | |
| *Amphioplus strongyloplax* | 1 | | | | | | | | | |
| *Leptosynapta albicans* | 1 | | | | | | | | 2 | |
| *Ophiura lütkeni* | 1 | | | | | | | | | |
| *Pachythone rubra* | 1 jv | | | | | | | | | |
| *Cucumaria calcigera* | | 3 | 2 jv | | | | | | | |
| echinoid | | 1 jv | | | | | | | | |
| holothuroid | | 25 sm | | | | | | | | |

## SANTA CRUZ CANYON *(Continued)*

| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **ECHINODERMS** | | | | | | | | | | |
| *Ophiopholis bakeri* | | 19 | 11 | 1 | | | | 2 | | |
| asteroid | | 1 sm | | | | | | | | |
| *Amphioplus* sp. | | 1 frg | | | | | | | | |
| *Spatangus* sp. | | 1 jv | | | | | | | | |
| *Ophiacantha normani* | | 1 | | | | | | | | |
| *Ophionereis eurybrachiplax* | | 1 | | | | | | | | |
| *Brissopsis pacifica* | | | | 8 | | | | | | |
| *Amphipholis squamata* | | | | | 7 | | | | | |
| *Molpadia* ?, jv | | | | | | | | | 5 jv | |
| ophiolepidid | | | | | | | | | 1 jv | |
| **MOLLUSKS** | | | | | | | | | | |
| chitons, 2 spp. | | 34 | 27 | 16 | | | | | | |
| *Balcis* sp. | | 7 | 36 jv | | | | | | | |

## SANTA CRUZ CANYON *(Continued)*

| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **MOLLUSKS** | | | | | | | | | | |
| *Delectopecten* sp. | | 5 | 5 | | | | | | | |
| *Leda* sp. | | 1 | | | | | | | | |
| *gastropods*, 6 spp. | | 9 | | | | | | | | |
| *Crepidula* sp. | | | 1 | | | | | | | |
| *Nassarius* sp. | | | 2 | | | | | | | |
| clam, small | | | 1 | | | | | | | |
| gastropod, sm | | | 3 | | | | | | | |
| *Axinopsida* sp. | | | | ?5 | | | | | | |
| *Bittium* sp., shells, some dead | | | | 32 | | | | | | |
| *Dacrydium pacificum* | | | | 1 | | 1 | | | | |
| *Eulima* sp. | | | | 9 | | | | | | |
| *Nuculana* sp. | | | | 3 | | | | | | |
| *Tellina carpenteri* | | | | 36 | | | | | | |

## SANTA CRUZ CANYON *(Continued)*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **MOLLUSKS** | | | | | | | | | | |
| moon snail, small | | | | 1 | | | | | | |
| limpet, white | | | | 7 | | | | | | |
| solenogasters | | | | | 6 | 11 | | 4 | | |
| **CRUSTACEANS** | | | | | | | | | | |
| amphipods | many | 25 | 45 | | | | | | | |
| isopods | sev. | | | | | | | | | |
| anthurid | | 1 | 1 | | | | | | | |
| apseudid | | | | | | | 1 | | | |
| cirolanid | | 3 | | | | | | | | |
| *Gnathia* sp. | | 3 | | | | | | | | |
| *Munna* sp. | | 2 | | | | | | | | |
| ?parasitic isopod | | | 3 | | | | | | | |
| other kinds | | 7 | 5 | | | | 1 | | | |

## SANTA CRUZ CANYON *(Continued)*

| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **CRUSTACEANS** | | | | | | | | | | |
| tanaids | | 6 | 8 | | | | 2 | | | |
| ostracods | pres | | 10 | | | | | | | |
| Cumaceans | | | | | | | | | | |
| *Hemilamprops californica* | 1 | | | | | | | | | |
| nr *Sympodomma* sp. | | 3 | 19 | | | | | | | |
| *Cumella* sp., heavily dentate | | | 1 | | | | | | | |
| *Eudorella pacifica* | | | 1 | | | | | | | |
| other cumaceans | | | 6 | | | | | | | |
| *Scalpellum* sp. | sev. | | | | | | | | | |
| pagurid crab | | | 1 | | | | | | | |
| crab, small | | | 1 | | | | | | | |
| **OTHERS** | | | | | | | | | | |
| sea whip | 1 | | | | | | 1 | | | |

## SANTA CRUZ CANYON *(Continued)*

| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **OTHERS** | | | | | | | | | | |
| ceriantharian | 1 | | | | | | | | | |
| nemerteans | 2 | | | 2 | 4 | 10 | | 5 | | 1 sm |
| nematodes | 10 | 6 | 6 | | 3 | | | 2 | | |
| sipunculid, slender, boring | 1 | 3 | | | | | | | | |
| pycnogonid | 1 | | 9 | | | | | | | |
| anemone, warty | | 5 | | | | | | | | |
| solitary coral | | 2 | 1 | | | | | | | |
| sipunculid, papillate distally | | 3 | | | | | | | | |
| sipunculid, other | | | 10 | | | | | | | |
| ascidians | | | | | | | | | | |
| *Boltenia* sp. | | 1 | | | | | | | | |
| *Chelyosoma* sp. | | 1 | 2 | | | | | | | |
| bryozoans | | pres | | | | | | | | |

## SANTA CRUZ CANYON *(Continued)*

| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **OTHERS** | | | | | | | | | | |
| hydroids | | pres | pres | | | | | | | |
| coelenterate | | | 1 | | | | | | | |
| anemone | | | | 2 sm | | 4 | | 1 sm | | |
| enteropneust | | | | | | 1 frg | | | | |

## SANTA CRUZ CANYON *(Continued)*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Station number | 6803 | 6805 | 6806 | 6804 | 6809 | 6812 | 3031 | 6808 | 6810 | 6811 |
| Depth in meters | 89 | 218 | 221 | 459 | 623 | 676 | 800 | 902 | 1387 | 1624 |
| Kind of sediment | sand | rock, sand | rock, coarse sand | coarse sand | gravel, mud, pebbles | mud | sand | mud | mud, sand, gravel | mud |
| Gear used | CG | CG | CG | CG | CG | CG | OPG | CG | CG | CG |
| Vol. of sample, cu. ft. | 0.26 | 1.2 | 2.4 | 1.14 | 1.43 | 4.16 | 0.31 | 4.8 | 5.74 | 4.16 |
| Wt. of animals, gms. | 14.7 | 17.5 | 7.0 | 146.8 | 0.1 | 0.9 | 0.3 | 1.0 | negl. | negl. |
| **NUMBERS OF POLYCHAETES** | | | | | | | | | | |
| Species | 44 | 26 | 26 | 17 | 15 | 14 | Incompletely analyzed | 14 | 8 | 1 |
| Specimens | 374 | 71 | 76 | 367 | 33 | 37 | | 71 | 10 | 1 |
| **ECHINODERMS** | | | | | | | | | | |
| Species | 6 | 3 | 2 | 4 | 2 | 1 | | 1 | 3 | 0 |
| Specimens | 24 | 21 | 10 | 106 | 8 | 1 | | 2 | 8 | 0 |
| **MOLLUSKS** | | | | | | | | | | |
| Species | | 11 | 7 | 9 | 1 | 2 | | 2 | 0 | 1 |
| Specimens | | 56 | 75 | 110 | 6 | 12 | | 5+ | 0 | 1 |
| **CRUSTACEANS** | | | | | | | | | | |
| Species | (not analyzed) | | | | | | | | | |
| Specimens | | | | | | | | | | |
| **OTHERS** | | | | | | | | | | |
| Species | 6 | 9 | 7 | 3 | 2 | 3 | | 5 | incom- | 1 |
| Specimens | 16 | 23 | 29 | 4+ | 7 | 15 | | 11 | plete | 1 |
| **TOTALS** | | | | | | | | | | |
| Species | (incomplete) | | | | | | | | | |
| Specimens | | | | | | | | | | |
| | | | | | | | | | | |

## SANTA CRUZ CANYON *(Continued)*

| Station number . . . . . | Characteristics of the screenings | Largest species | Most conspicuous or abundant species |
|---|---|---|---|
| 6803 | shell, sand with many small animals | none | onuphids, pagurids, amphipods |
| 6805 | rocks, green sand, sponge, corals, tunicate, chitons | *Ophionereis eurybrachyplax* | *Ophiopholis bakeri*, *Glycera tesselata* |
| 6806 | rocks, green sand, coarse brown sponge | *Glycera americana*, *Ophiopholis* | *Balcis*, chitons |
| 6804 | hexactinellid sponge, shell, sand, many animals | *Brissopsis pacifica* | *Amphipholis pugetana*, *Tellina carpenteri* |
| 6809 | hexactinellid sponge, worms | *Clymenopsis cingulata* | none |
| 6812 | shell, sand, pitch lumps, animals | none | *Aricidea*, solenogasters |
| 3031 | dark gray sand, animals | *Notomastus* | *Anobothrus* |
| 6808 | hexactinellid sponge, animals | none | *Leiochrides*, *Sternaspis* |
| 6810 | gray gravel, few worms, little life | *Phyllochaetopterus limicolus* | none |
| 6811 | gray gravel, sponge, nr dead, trace of life | none | none |

# CATALINA CANYON

| Station number | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 88 | 216 | 266 | 362 | 379 | 549 | 559 | 708 | 853 | 914 | 1272 |
| Kind of sediment | mud | mud | mud | mud, sand | mud | mud | mud | rocks | rocks | mud | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | OPG | CG |
| Vol. of sample, cu. ft. | 2.44 | 3.94 | 2.72 | 2.87 | 3.66 | 5.52 | 4.16 | rocks | rocks | 2.58 | 5 45 |
| Wt. of animals, gms. | 165.3 | 44.2 | 59.2 | 98 4 | 133.6 | 17.5 | 31.3 | 4.3 | negl. | 19.0 | 4.0 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Aglaophamus dicirris* | 15 | | | | | | | | | | |
| *Amage anops* | 4 | | | | | | | | | | |
| *Ammotrypane aulogaster* | 1 lg | 1 | 1 lg | 8 lg | 5 lg | | | 1 | | | 1 |
| *Aricidea uschakowi* | 2 | | | | | 6 jv | 2 jv | | | | |
| *Brada pluribranchiata* | 1 | | | | 7 | | | | | | |
| *Glycera capitata* | 2 jv | 4 | | | | | | 1 sm | | | |
| *Goniada brunnea* | 2 | 4 | | | | | 1 | | | 4 | |
| *Harmothoë* sp. | ?7 | | | | 1 | | | | | | |
| *Laonice foliata* | 2 | 5 lg | | | 1 | | | | | | |
| *Lumbrinëris bicirrata* | 2 lg | ?1 lg | | | 1 lg | | | | | | |
| *Lumbrineris ?longensis* | 15 sm | | | | | | | | | | |
| *Lysippe annectens* | 1 sm | | | | | | 8 | | | | 8 |
| *Myriochele gracilis* | 5 | | 5 | | | 1 | 3 | | | | |

## CATALINA CANYON *(Continued)*

| Station number | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 88 | 216 | 266 | 362 | 379 | 549 | 559 | 708 | 853 | 914 | 1272 |
| Kind of sediment | mud | mud | mud | mud, sand | mud | mud | mud | rocks | rocks | mud | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | OPG | CG |
| Vol. of sample, cu. ft. | 2.44 | 3.94 | 2.72 | 2.87 | 3.66 | 5.52 | 4.16 | rocks | rocks | 2.58 | 5.45 |
| Wt. of animals, gms. | 165.3 | 44.2 | 59.2 | 98.4 | 133.6 | 17.5 | 31.3 | 4.3 | negl | 19.0 | 4.0 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Notomastus tenuis* | 1 | | | | 3 | | | | | | |
| *Onuphis parva* | 3 | 10 | | ?7 | 1 | | | | | | |
| *Paraonis gracilis* | 2 | 4 | 1 | | | 4 | 1 | | | 2 | 4 |
| *Pholoë glabra* | 30 | | | | | | | | | 1 sm | |
| *Pectinaria californiensis* | 12 | ?12 sm | 10 | 63 | 118 | | 3 | | | | |
| *Pista disjuncta* | 30 | | | | | | | | | | 1 |
| *Prionospio cirrifera* | 3 | | | | | | | | | | |
| *Prionospio pinnata* | 2 | 10 | 12 | 5 sm | 4 sm | 2 frg | 1 | | | | |
| *Praxillella gracilis* | 4 lg | | | | | | | 1 frg | | | |
| *Sphaerodorum* sp. | 1 | | | | 1 | | | | | | |
| *Sternaspis fossor* | 24 | 1 | | | | | | | | 3 sm | ?4 |
| *Tharyx tesselata* | 7 | | 2 | | 2 | | | | | 15 | 10 |
| *Travisia pupa* | 2 | 4 lg | | 2 | 3 lg | | | | | | |

## CATALINA CANYON *(Continued)*

| Station number | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 88 | 216 | 266 | 362 | 379 | 549 | 559 | 708 | 853 | 914 | 1272 |
| Kind of sediment | mud | mud | mud | mud, sand | mud | mud | mud | rocks | rocks | mud | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | OPG | CG |
| Vol. of sample, cu. ft. | 2.44 | 3.94 | 2.72 | 2.87 | 3.66 | 5.52 | 4.16 | rocks | rocks | 2.58 | 5.45 |
| Wt. of animals, gms. | 165.3 | 44.2 | 59.2 | 98.4 | 133.6 | 17.5 | 31.3 | 4.3 | negl. | 19.0 | 4.0 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Ancistrosyllis breviceps* | | 1 | 1 | 1 | 2+ | | 1 | | | | |
| *Aricidea*, unknown sp. | | 1 | | | | | | | | | |
| *Dorvillea* sp. | | 1 | | | | | | | | | |
| *Drilonereis* sp. | | 2 | | | | | | | | 1 sm | |
| *Eunice* sp. | | 1 frg | | | | | | | | | |
| ?*Lanice* sp. | | 1 frg | | | | | | | | | |
| *Lumbrineris cruzensis* | | 21 sm | 19 sm | 6 | 14 | | | | | 1 | |
| *Lumbrineris index* | | 1 frg | | | | | | | | | 1 lg |
| *Haploscoloplos elongatus* | | 4 jv | 6 | 23 | 38 | 1 | 44 | | | | |
| *Harmothoë* cf. *imbricata* | | 1 | | | | | | | | | |
| *Heteromastus* sp. | | 1 jv | | | | | | | | | |
| *Maldane sarsi* | | 6 | 87 | 6 | 15 | 3 | | | | 2 | |
| *Melinna heterodonta* | | ?4 | 2 | 1 | 36 | | | | | | |

## CATALINA CANYON *(Continued)*

| Station number | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 88 | 216 | 266 | 362 | 379 | 549 | 559 | 708 | 853 | 914 | 1272 |
| Kind of sediment | mud | mud | mud | mud, sand | mud | mud | mud | rocks | rocks | mud | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | OPG | CG |
| Vol. of sample, cu. ft. | 2.44 | 3.94 | 2.72 | 2.87 | 3.66 | 5.52 | 4.16 | rocks | rocks | 2.58 | 5.45 |
| Wt. of animals, gms. | 165.3 | 44.2 | 59.2 | 98.4 | 133.6 | 17.5 | 31.3 | 4.3 | negl. | 19.0 | 4.0 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Nephtys ferruginea* | | 3 | | | 12 jv | | | | | | |
| *Nereis* sp. | | ?2 | 1 jv | | | | | | | | |
| *Nothria pallida* | | 9 | | | | | | | | | |
| *Praxillella a. pacifica* | | 2 | | 3 | | | 2 frg | | | | |
| *Prionospio malmgreni* | | 2 jv | | | | | | | | | |
| *Terebellides stroemi* | | 4 sm | 8 | | | | 2 | | | 1 | |
| *Tharyx* sp. | | 2 jv | | | | | | | | | |
| *Asychis disparidentata* | | | 1 | 2 | | | 1 | | | | |
| *Eunice americana* | | | 1 lg | | | | | | | | |
| nephtyid | | | 4 frg | 5 | | | | | | | |
| *Nothria iridescens* | | | 5 lg | 6 | 5 | | | | | 5 lg | |
| *Oxydromus a. glabrus* | | | 1 | 1 frg | 1 | | ?1 jv | | | | |
| *Praxillella* sp. | | | 1 frg | | | | | | | | |

## CATALINA CANYON *(Continued)*

| Station number | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 88 | 216 | 266 | 362 | 379 | 549 | 559 | 708 | 853 | 914 | 1272 |
| Kind of sediment | mud | mud | mud | mud, sand | mud | mud | mud | rocks | rocks | mud | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | OPG | CG |
| Vol. of sample, cu. ft. | 2.44 | 3.94 | 2.72 | 2.87 | 3.66 | 5.52 | 4.16 | rocks | rocks | 2 58 | 5.45 |
| Wt. of animals, gms. | 165.3 | 44.2 | 59.2 | 98.4 | 133.6 | 17.5 | 31.3 | 4.3 | negl | 19.0 | 4.0 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Spiophanes*, unknown sp. | | | 2 frg | | | | 10 | | | 4 | |
| *Axiothella* sp. | | | | 1 frg | 1 | | | | | | |
| *Brada glabra* | | | | 4 | 15 | 10 | 2 | | 1 | 15 | |
| *Brada pilosa* | | | | 1 frg | | 17 | | | | | |
| *Amphicteis scaphobranchiata* | | | | 1 frg | | | | | | | |
| *Chloeia pinnata* | | | | 1 jv | | | | | | | |
| *Dorvillea articulata* | | | | 1 frg | | | | | | | |
| *Drilonereis ?nuda* | | | | 1 | | | | | | 1 sm | |
| *Harmothoë*, nr *lunulata* | | | | 2 | | | | | | | |
| *Owenia* sp. | | | | 5 jv | | | | | | | |
| *Pilargis maculata* | | | | 1 frg | | | | | | | |
| *Scalibregma inflatum* | | | | 1 frg | | | 1 frg | | | | |
| *Aglaophamus erectans* | | | | | 1 | | | | | | |

## CATALINA CANYON (Continued)

| Station number | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 88 | 216 | 266 | 362 | 379 | 549 | 559 | 708 | 853 | 914 | 1272 |
| Kind of sediment | mud | mud | mud | mud, sand | mud | mud | mud | rocks | rocks | mud | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | OPG | CG |
| Vol. of sample, cu. ft. | 2.44 | 3.94 | 2.72 | 2.87 | 3.66 | 5.52 | 4.16 | rocks | rocks | 2 58 | 5.45 |
| Wt. of animals, gms. | 165.3 | 44.2 | 59.2 | 98.4 | 133.6 | 17.5 | 31.3 | 4.3 | negl. | 19.0 | 4.0 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Ampharete arctica* | | | | | 15 | | | | | | |
| *Chone* sp. | | | | | 2 | | | | | | |
| *Euclymene* sp. | | | | | 1 | | | | | | |
| *Hesperonoë* sp. | | | | | 1 | | | | | | |
| *Potamethus* sp. | | | | | 1 | | | | | | |
| *Tharyx monilaris* | | | | | 4 | | | | | | 2 |
| *Anobothrus gracilis* | | | | | | 4 | 565+ | | | | 2 |
| *Califia calida* | | | | | | 2 lg | 3 lg | | | | |
| *Cirratulus* sp. | | | | | | 3 | | | | | |
| *Glycera* sp. | | | | | | 1 jv | | | | | |
| *Leiochrides hemipodus* | | | | | | 4 | 4 | | | | |
| *Lumbrineris* sp. | | | | | | 3 sm | 2 sm | | | | |
| *Ancistrosyllis tentaculata* | | | | | | | 3 | | | | |

## CATALINA CANYON *(Continued)*

| Station number | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 88 | 216 | 266 | 362 | 379 | 549 | 559 | 708 | 853 | 914 | 1272 |
| Kind of sediment | mud | mud | mud | mud, sand | mud | mud | mud | rocks | rocks | mud | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | OPG | CG |
| Vol. of sample, cu. ft. | 2.44 | 3.94 | 2.72 | 2.87 | 3.66 | 5.52 | 4.16 | rocks | rocks | 2.58 | 5.45 |
| Wt. of animals, gms. | 165.3 | 44.2 | 59.2 | 98.4 | 133.6 | 17.5 | 31.3 | 4.3 | negl. | 19.0 | 4.0 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Aricidea lopezi* | | | | | | | 2 | | | | 2 |
| *Cossura candida* | | | | | | | 2 | | | | |
| *Notomastus* sp. | | | | | | | 2 lg | | | | |
| sabellid | | | | | | | 1 sm | | | | |
| *Spiophanes pallidus* | | | | | | | ?10 | | | 4 | |
| ampharetids | | | | | | | | 2 sm | | 6 sm | |
| *Chaetozone ?gracilis* | | | | | | | | 1 frg | 1 | 3 | |
| *Lepidonotus caelorus* | | | | | | | | 1 | | | |
| *Nothria conchylega* | | | | | | | | 1 | | | |
| *Leaena caeca* | | | | | | | | | 1 | | |
| hesionid | | | | | | | | | 1 frg | | |
| *?Nicomache* sp. | | | | | | | | | 3 jv | | 1- |
| *Aricidea* cf. *suecica* | | | | | | | | | | 154 lg | |

## CATALINA CANYON *(Continued)*

| Station number | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 88 | 216 | 266 | 362 | 379 | 549 | 559 | 708 | 853 | 914 | 1272 |
| Kind of sediment | mud | mud | mud | mud, sand | mud | mud | mud | rocks | rocks | mud | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | OPG | CG |
| Vol. of sample, cu. ft. | 2.44 | 3.94 | 2.72 | 2.87 | 3.66 | 5.52 | 4.16 | rocks | rocks | 2.58 | 5.45 |
| Wt. of animals, gms. | 165.3 | 44.2 | 59.2 | 98.4 | 133.6 | 17.5 | 31.3 | 4.3 | negl. | 19.0 | 4.0 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Glycera c. branchiopoda* | | | | | | | | | | 3 sm | |
| *Naineris* sp. | | | | | | | | | | 2 sm | |
| *Ninoë gemmea* | | | | | | | | | | 1 | 1 |
| *Praxillura maculata* | | | | | | | | | | 15 | |
| *Pherusa* sp. | | | | | | | | | | 1 | |
| *Phyllochaetopterus limicolus* | | | | | | | | | | 1 | |
| *Polyophthalmus translucens* | | | | | | | | | | 1 | |
| *Aricidea ramosa* | | | | | | | | | | | 1 |
| capitellid, A | | | | | | | | | | | 4 |
| capitellid, B | | | | | | | | | | | 2 |
| *Chaetozone* sp. | | | | | | | | | | | 1 |
| *Lumbrineris ?latreilli* | | | | | | | | | | | 1 frg |
| *Myriochele* sp. | | | | | | | | | | | 1 |

## CATALINA CANYON *(Continued)*

| Station number | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 88 | 216 | 266 | 362 | 379 | 549 | 559 | 708 | 853 | 914 | 1272 |
| Kind of sediment | mud | mud | mud | mud, sand | mud | mud | mud | rocks | rocks | mud | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | OPG | CG |
| Vol. of sample, cu. ft. | 2.44 | 3.94 | 2.72 | 2.87 | 3.66 | 5.52 | 4.16 | rocks | rocks | 2.58 | 5.45 |
| Wt. of animals, gms. | 165.3 | 44.2 | 59.2 | 98.4 | 133.6 | 17.5 | 31.3 | 4.3 | negl. | 19.0 | 4.0 |
| **POLYCHAETES** | | | | | | | | | | | |
| *Spiophanes anoculata* | | | | | | | | | | | 3 |
| **ECHINODERMS** | | | | | | | | | | | |
| *Amphiacantha amphacantha* | 9 | | | | | | | | | | |
| *Amphiura arcystata* | 24 | | 1 | | | | | | | | |
| *Amphiodia urtica* | 606 | | | 27 | 1 | | | 1 | | | |
| *Molpadia intermedia* | 2 lg | 1 | | | | | | | | | |
| *Amphipholis squamata* | 105 | | 4 | 42 | 63 | | | | | | |
| *Amphioplus strongyloplax* | 18 | 2 | | | | | | | | | |
| *Ophiura lütkeni* | 3 | | | | | | | | 1 | | |
| *Leptosynapta* sp. | | | | 12 | 4 | | | | | | |
| *Ophiacantha pacifica* | | | | 1 | | | | | | | |
| *Allocentrotus fragilis* | | | | | 1 | | | | | 2 sm | |
| *Brissopsis pacifica* | | | | | 1 | 2 | 4 | 2 | | | |

## CATALINA CANYON *(Continued)*

| Station number | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 88 | 216 | 266 | 362 | 379 | 549 | 559 | 708 | 853 | 914 | 1272 |
| Kind of sediment | mud | mud | mud | mud, sand | mud | mud | mud | rocks | rocks | mud | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | OPG | CG |
| Vol. of sample, cu. ft. | 2.44 | 3.94 | 2.72 | 2.87 | 3.66 | 5.52 | 4.16 | rocks | rocks | 2.58 | 5.45 |
| Wt. of animals, gms | 165.3 | 44.2 | 59.2 | 98.4 | 133.6 | 17.5 | 31.3 | 4.3 | negl | 19.0 | 4.0 |
| **ECHINODERMS** | | | | | | | | | | | |
| *Brisaster townsendi* | | | | | | 1 | | | | | |
| *Amphipholis pugetana* | | | | | | 1 | 4 | 27 | 6 | | |
| *Ophiomusium jolliensis* | | | | | | 4 | 13 | | | | |
| *Ophiura leptoctenia* | | | | | | 1 | | | | 11 sm | |
| *Amphiura diomedeae* | | | | | | | 24 | | | | |
| *Amphiura seminuda* | | | | | | | | 3 | | | |
| *Ophiopholis bakeri* | | | | | | | | 2 | | | |
| *Ophiopholis longispina* | | | | | | | | | | 1 sm | |
| *Ophiacantha normani* | | | | | | | | | | | 3 |
| **MOLLUSKS** | | | | | | | | | | | |
| *Aglaja* sp. | 1 | | | | | | | | | | |
| *Crystallophrisson* spp. | 3 | | 1 | 4 | | 8 | | | | 4 | 1 |
| *Cadulus* spp. | pres | | | 2 | | | | | | 5 | |

## CATALINA CANYON *(Continued)*

| Station number | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 88 | 216 | 266 | 362 | 379 | 549 | 559 | 708 | 853 | 914 | 1272 |
| Kind of sediment | mud | mud | mud | mud, sand | mud | mud | mud | rocks | rocks | mud | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | OPG | CG |
| Vol. of sample, cu. ft. | 2.44 | 3.94 | 2.72 | 2.87 | 3.66 | 5.52 | 4.16 | rocks | rocks | 2.58 | 5.45 |
| Wt. of animals, gms. | 165.3 | 44.2 | 59.2 | 98.4 | 133.6 | 17.5 | 31.3 | 4.3 | negl. | 19.0 | 4.0 |
| **MOLLUSKS** | | | | | | | | | | | |
| *Dentalium* sp. | pres | | | ca 10 | | | | | | | |
| *Nucula* sp. | pres | | | 4 | | | | | | | |
| *Rochefortia* sp. | pres | | | | | | | | | | |
| *Cardita* sp. | | | 2 jv | | | | | | | | |
| *Cylichnella* sp. | | | 1 | | | | | | | | |
| clam, small | | | 3 | | | 10 | | 9 | | | |
| *Prochaetoderma* sp. | | | 2 | 1 | | 2 | | | | | |
| *Amygdalum pallidulum* | | | | 1 | | | | | | | |
| *Saxicavella pacifica* | | | | 2 | | | | | | | |
| *Dacrydium pacificum* | | | | | | 44 | pres | 4 | | | |
| *Solemya* sp. | | | | | | 1 jv | | | | | |
| *Mitrella permodesta* | | | | | | | | 5 | | | |
| chiton | | | | | | | | 1 | | | |

## CATALINA CANYON *(Continued)*

| Station number | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 88 | 216 | 266 | 362 | 379 | 549 | 559 | 708 | 853 | 914 | 1272 |
| Kind of sediment | mud | mud | mud | mud, sand | mud | mud | mud | rocks | rocks | mud | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | OPG | CG |
| Vol. of sample, cu. ft. | 2.44 | 3.94 | 2.72 | 2.87 | 3.66 | 5.52 | 4.16 | rocks | rocks | 2.58 | 5.45 |
| Wt. of animals, gms. | 165.3 | 44.2 | 59.2 | 98.4 | 133.6 | 17.5 | 31.3 | 4.3 | negl. | 19.0 | 4.0 |
| **MOLLUSKS** | | | | | | | | | | | |
| *Acila castrensis* | | | | | | | | | | 2 | |
| *Cuspidaria* sp. | | | | | | | | | | 1 | |
| **CRUSTACEANS** | | | | | | | | | | | |
| amphipods | 18 | 13 | 12 | 7 | 21 | 5 | 6 | 1 | | 7 | |
| caprellid | | | | | | | 4 | | | | |
| isopod, gnathid | 1 | | | | | | | | | 1 | |
| anthurid | | | | | | | | | | 13 | |
| cirolanid | | | | | | | | | | 1 | |
| tanaids | 15 | | | | | | | | 1 | 1 | |
| ostracods | 7 | | | 4 | 9 | | 1 | | | | |
| nebalian | | | | | | | | | | 2 | |
| cumaceans | | | | | | | | | | 3 | |
| *Procampylaspis* sp. | 1 | | | | | | | | | | |

## CATALINA CANYON *(Continued)*

| Station number | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 88 | 216 | 266 | 362 | 379 | 549 | 559 | 708 | 853 | 914 | 1272 |
| Kind of sediment | mud | mud | mud | mud, sand | mud | mud | mud | rocks | rocks | mud | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | OPG | CG |
| Vol. of sample, cu. ft. | 2.44 | 3.94 | 2.72 | 2.87 | 3.66 | 5.52 | 4.16 | rocks | rocks | 2.58 | 5 45 |
| Wt. of animals, gms. | 165.3 | 44.2 | 59.2 | 98.4 | 133.6 | 17.5 | 31.3 | 4.3 | negl | 19 0 | 4 0 |
| **CRUSTACEANS** | | | | | | | | | | | |
| *Diastylis ?pellucida* | | 2 jv | | | | | | | | | |
| *Campylaspis* sp. | | | | 1 | | | | | | | |
| **OTHERS** | | | | | | | | | | | |
| ceriantharian | 1 | 1 | | | | | | | | | |
| sipunculids | | 2 | 4 | | 2 sm | 2 | 27 | | | 1 sm | 1 sm |
| nemerteans | | 2 | 3 | 2 | 1 | 2 sm | 1 lg | | | 2 sm | |
| sea whip | | | 1 | | | 1 sm | | | | | |
| *Arhynchite* sp. | | | | 1 lg | 1 lg | | | | | | |
| bryozoan | | | | | | | | pres | | | |
| hydroid | | | | | | | | pres | | | |
| leech | | | | | | | | | | 1 sm | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

## CATALINA CANYON *(Continued)*

| Station number | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth in meters | 88 | 216 | 266 | 362 | 379 | 549 | 559 | 708 | 853 | 914 | 1272 |
| Kind of sediment | mud | mud | mud | mud, sand | mud | mud | mud | rocks | rocks | mud | mud |
| Gear used | CG | CG | CG | CG | CG | CG | CG | CG | CG | OPG | CG |
| Vol. of sample, cu. ft. | 2.44 | 3.94 | 2.72 | 2.87 | 3.66 | 5.52 | 4.16 | rocks | rocks | 2.58 | 5.45 |
| Wt. of animals, gms. | 165.3 | 44.2 | 59.2 | 98.4 | 133.6 | 17.5 | 31.3 | 4.3 | negl. | 19.0 | 4.0 |
| **NUMBERS OF** | | | | | | | | | | | |
| **POLYCHAETES** Species | 26 | 31 | 20 | 25 | 29 | 14 | 27 | 7 | 5 | 24 | 19 |
| Specimens | 180 | 125 | 170 | 157 | 311 | 61 | 678 | 8 | 7 | 246 | 50 |
| **ECHINODERMS** Species | 7 | 2 | 2 | 4 | 5 | 5 | 4 | 5 | 2 | 3 | 1 |
| Specimens | 767 | 3 | 5 | 82 | 70 | 9 | 45 | 35 | 7 | 14 | 3 |
| **MOLLUSKS** Species | 6 | 0 | 5 | 7 | 0 | 5 | 1 | 4 | 0 | 4 | 1 |
| Specimens | 8 | 0 | 9 | 24 | 0 | 65 | 1 | 19 | 0 | 12 | 1 |
| **CRUSTACEANS** Species | 5 | 2 | 1 | 3 | 2 | 1 | 3 | 1 | 1 | 7 | 0 |
| Specimens | 42 | 15 | 12 | 12 | 30 | 5 | 11 | 1 | 1 | 28 | 0 |
| **OTHERS** Species | 1 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 0 | 3 | 1 |
| Specimens | 1 | 5 | 8 | 3 | 4 | 5 | 28 | 2 | 0 | 4 | 1 |
| **TOTALS** Species | 45 | 38 | 31 | 41 | 39 | 28 | 37 | 19 | 8 | 41 | 22 |
| Specimens | 998 | 148 | 204 | 278 | 415 | 145 | 763 | 65 | 15 | 304 | 55 |

## CATALINA CANYON *(Continued)*

| Station number - - - - - | 6823 | 6822 | 6821 | 6818 | 6819 | 6831 | 6820 | 6830 | 6829 | 2847 | 6828 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Characteristics of the screenings | silty gray tubes, broken shells, black wood, many animals | mucoid debris with animals | mud tubes, debris, animals | gravel, sand, brissopsids, worms | urchins, worms, tubes, debris | brissopsids, worms, dead animal remains | shelly rubble, ophiuroids, worms | shaley rubble, brissopsids, ophiuroids, worms | shaley rubble, ophiuroids | dead shells, siliceous sponge, small animals | dead shells, siliceous sponge, tubes, small animals |
| Largest species | caudate holothurian | *Amphioplus, Travisia* | nemertean | *Brissopsis, Arhynchite* | *Allocentrotus, Arhynchite, Travisia pupa* | brissopsids | *Brissopsis* | *Brissopsis pacifica* | none | none | none |
| Most abundant or conspicuous species | *Amphiodia urtica, Amphipholis squamata, Pista* | *Lumbrineris cruzensis, Prionospio pinnata* | *Maldane sarsi* | *Amphipholis squamata, Pectinaria* | *Amphipholis squamata, Pectinaria* | *Dacrydium, Brada pilosa* | *Anobothrus, Haploscoloplos, sipunculid* | *Amphipholis pugetana* | none (sample poor) | *Aricidea, Praxillura* | *Lysippe annectens* |

## SAN CLEMENTE RIFT VALLEY

| Station number | 6838 | 6839 | 6841 | 6840 |
|---|---|---|---|---|
| Depth in meters | 950 | 1406 | 1591 | 1620 |
| Kind of sediment | rock, sand | rock, sand | mud, gravel | nodules |
| Gear used | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | ← (all samples very small, due to hard bottom) → | | | |
| Wt. of animals, gms. | 0.2 | 0.2 | negl. | negl. |
| **POLYCHAETES** | | | | |
| *Ampharete* sp. | 1 | | 1 | |
| *Ammotrypane pallida* | 1 | 2 | | |
| *Glycera*, nr *capitata* | 1 | ?2 | | |
| *Harmothoë crassicirrata* | 1 | | | |
| *Laonice foliata* | 1 | | | |
| *Leaena ?caeca* | 1 | | | |
| *Leiochrides hemipodus* | 2 | 1 | | |
| *Melinnexis moorei* | tube | 1 | 1 | 2 |
| *Lumbrineris limicola* | 1 | 1 | | |
| *Praxillella gracilis* | 1 | | | |
| *Scionella japonica* | 1 | | | |
| *Spiophanes anoculata* | 2 | 1 | | |
| *Aphrodita* sp. | | 1 jv | | |

## SAN CLEMENTE RIFT VALLEY *(Continued)*

| Station number | 6838 | 6839 | 6841 | 6840 |
|---|---|---|---|---|
| Depth in meters | 950 | 1406 | 1591 | 1620 |
| Kind of sediment | rock, sand | rock, sand | mud, gravel | nodules |
| Gear used | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | ← (all samples very small, due to hard bottom) → | | | |
| Wt. of animals, gms. | 0.2 | 0.2 | negl. | negl. |
| **POLYCHAETES** | | | | |
| *Aglaophamus* sp. | | 1 | | |
| *Aricidea uschakowi* | | 1 | | |
| *Asychis* sp. | | 1 | | |
| ampharetid | | 12 | | |
| *Nothria* sp. | | 1 | | |
| *Sternaspis* sp. | | 1 | | |
| *Scalibregma inflatum* | | 1 | | |
| *Terebellides* sp. | | 1 | | |
| *Tharyx* sp. | | 1 | | |
| *Brada glabra* | | | 1 | |
| cirratulid, abranchiate | | | 1 | |
| *Lumbriclymene lineus* | | | 1 | |
| *Sphaerodorum ?brevicapitis* | | | 1 | |

## SAN CLEMENTE RIFT VALLEY *(Continued)*

| | | | | |
|---|---|---|---|---|
| Station number | 6838 | 6839 | 6841 | 6840 |
| Depth in meters | 950 | 1406 | 1591 | 1620 |
| Kind of sediment | rock, sand | rock, sand | mud, gravel | nodules |
| Gear used | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | (all samples very small, due to hard bottom) | | | |
| Wt. of animals, gms. | 0.2 | 0.2 | negl. | negl. |
| **POLYCHAETES** | | | | |
| sabellid | | | 1 | 1 |
| **ECHINODERMS** | | | | |
| *Ophiacantha bairdi* | 2 | | | |
| *Amphipholis pugetana* | 1 | | 1 | 1 |
| *Amphiura diastata* | 2 | | | |
| *Ophiura leptoctenia* | | 1 | 8 | 2 |
| ?*Plexechinus cinctus* | | 1- | | |
| *Astrophiura marionae* | | | | 2 |
| **MOLLUSKS** | | | | |
| clam, small white | 1 | 2 | 1 | |
| ?*Dacrydium* sp. | | | | 5 |
| **CRUSTACEANS** | | | | |
| amphipods | 3 | 2 | | 2 |

## SAN CLEMENTE RIFT VALLEY *(Continued)*

| | | | | |
|---|---|---|---|---|
| Station number | 6838 | 6839 | 6841 | 6840 |
| Depth in meters | 950 | 1406 | 1591 | 1620 |
| Kind of sediment | rock, sand | rock, sand | mud, gravel | nodules |
| Gear used | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | ← (all samples very small, due to hard bottom) → | | | |
| Wt. of animals, gms. | 0.2 | 0.2 | negl. | negl. |
| **CRUSTACEANS** | | | | |
| isopod, gnathid | | | 1 | 1 |
| ostracod, rectilinear | 1 | | | |
| ostracod, subspherical | | 2 | | |
| **OTHERS** | | | | |
| anemone, warty | 1 | | | |
| bryozoan | | | pres. | |
| nemertean | 2 | 1 | | 1 |
| horny sponge | | | pres. | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## SAN CLEMENTE RIFT VALLEY *(Continued)*

| | | | | |
|---|---|---|---|---|
| Station number | 6838 | 6839 | 6841 | 6840 |
| Depth in meters | 950 | 1406 | 1591 | 1620 |
| Kind of sediment | rock, sand | rock, sand | mud, gravel | nodules |
| Gear used | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | (all samples very small, due to hard bottom) | | | |
| Wt. of animals, gms. | 0.2 | 0.2 | negl. | negl. |
| **NUMBERS OF POLYCHAETES** | | | | |
| Species | 11 | 16 | 7 | 2 |
| Specimens | 13 | 29 | 7 | 3 |
| **ECHINODERMS** | | | | |
| Species | 1 | 2 | 1 | 0 |
| Specimens | 4 | 2 | 7 | 0 |
| **MOLLUSKS** | | | | |
| Species | 1 | 1 | 1 | 1 |
| Specimens | 1 | 2 | 1 | 5 |
| **CRUSTACEANS** | | | | |
| Species | 2 | 2 | 1 | 2 |
| Specimens | 4 | 4 | 1 | 3 |
| **OTHERS** | | | | |
| Species | 2 | 1 | 0 | 1 |
| Specimens | 3 | 1 | 0 | 1 |
| **TOTALS** | | | | |
| Species | 17 | 22 | 10 | 6 |
| Specimens | 25 | 38 | 16 | 12 |

## SAN CLEMENTE RIFT VALLEY (Continued)

| Station number . . . . . | 6838 | 6839 | 6841 | 6840 |
|---|---|---|---|---|
| Character of the screenings | 1.5 gal rocks, green sand, few animals | small rocks, green sand, few animals | rock, gravel, green mud, few animals | manganese nodules |
| Largest animal | nemertean | none | brown horny sponge | none |
| Most abundant or conspicuous species | none | ampharetid | *Ophiura leptoctenia* | ?*Dacrydium* |

## TANNER CANYON

| Station number | 6835 | 6836 | 6834 | 6837 | 6833 | 6832 |
|---|---|---|---|---|---|---|
| Depth in meters | 298 | 496 | 603 | 644 | 813 | 1298 |
| Kind of sediment | sand | sand, shell | mud | sand | sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.64 | 0.14 | 2.44 | 2.65 | 0.34 | 2.72 |
| Wt. of animals, gms. | 21.7 | 32.1 | 25.7 | 2.0 | 2.9 | 3.1 |
| **POLYCHAETES** | | | | | | |
| *Aricidea lopezi* | 2 | | | | | |
| *Aricidea*, nr *suecica* | 1 | | | | | |
| *Armandia bioculata* | 4 | | | | | |
| *Chaetozone ?setosa* | 1 | | | | | |
| *Chloeia pinnata* | 15 | | | | 10 | |
| *Dorvillea articulata* | 1 | | | | | |
| *Glycera* sp. | 2 jv | | | | 1 jv | |
| *Notomastus lineatus* | ?2 | | | | | |
| onuphids | 12 jv | | | | | |
| *Onuphis nebulosa* | 1 | | | | | |
| *Pisione*, nr *remota* | 1 | | | | | |
| *Polycirrus* sp. | 1 | | | | | |
| *Phyllochaetopterus limicolus* | 1 | | | 2 | | |

## TANNER CANYON *(Continued)*

| Station number | 6835 | 6836 | 6834 | 6837 | 6833 | 6832 |
|---|---|---|---|---|---|---|
| Depth in meters | 298 | 496 | 603 | 644 | 813 | 1298 |
| Kind of sediment | sand | sand, shell | mud | sand | sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.64 | 0.14 | 2.44 | 2.65 | 0.34 | 2.72 |
| Wt. of animals, gms. | 21.7 | 32.1 | 25.7 | 2.0 | 2.9 | 3.1 |
| **POLYCHAETES** | | | | | | |
| *Prionospio ?pygmaeus* | 5 | | | | | |
| *Scoloplos armiger* | 7 | | | | | |
| *Terebellides stroemi* | 2 | | ?16 | 19 | | ?1 lg |
| *Thalenessa spinosa* | 3 | | | | | |
| *Tharyx tesselata* | 3 | | | | | 1 |
| *Ammotrypane aulogaster* or sp. | | 6 | | 1 | 1 frg | |
| *Amphicteis mucronata* | | 2 | | | | |
| *Anaitides ?madeirensis* | | 1 | | | | |
| *Anobothrus* sp. | | 12 | | | | |
| *Aricidea*, nr *fauveli* | | 4 | | | | |
| *Eumida bifoliata* | | 1 lg | | | | |
| *Harmothoë* sp. | | 2 | | 1 | | |
| *Glycera tesselata* | | 2 | | | | |

## TANNER CANYON *(Continued)*

| Station number | 6835 | 6836 | 6834 | 6837 | 6833 | 6832 |
|---|---|---|---|---|---|---|
| Depth in meters | 298 | 496 | 603 | 644 | 813 | 1298 |
| Kind of sediment | sand | sand, shell | mud | sand | sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.64 | 0.14 | 2.44 | 2.65 | 0.34 | 2.72 |
| Wt. of animals, gms. | 21.7 | 32.1 | 25.7 | 2.0 | 2.9 | 3.1 |
| **POLYCHAETES** | | | | | | |
| *Lanice* sp. | | 1 | | | | |
| *Laonice* sp. | | 16 | 1 frg | 2 jv | 3 | |
| ?*Megalomma* sp. | | 2 | | 1 | | |
| *Myriochele pygidialis* | | 3 | | | | |
| nephtyid | | 1 frg | | | | |
| *Polydora* sp. | | 7 | | | | |
| *Sphaerodorum* sp. | | 2 | | | | 3 |
| *Aricidea lopezi rubra* | | | 13 | 26 | | 2 |
| *Aricidea ramosa* | | | 4 | 3 | | |
| *Barantolla* sp. | | | 1 | | | |
| *Brada glabra* | | | 5 | 5 | | |
| *Exogone ?uniformis* | | | 1 | 1 | | |
| *Glycera capitata* | | | 2 | 2 | | 1 |

## TANNER CANYON *(Continued)*

| | | | | | | |
|---|---|---|---|---|---|---|
| Station number | 6835 | 6836 | 6834 | 6837 | 6833 | 6832 |
| Depth in meters | 298 | 496 | 603 | 644 | 813 | 1298 |
| Kind of sediment | sand | sand, shell | mud | sand | sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.64 | 0.14 | 2.44 | 2.65 | 0.34 | 2.72 |
| Wt. of animals, gms. | 21.7 | 32.1 | 25.7 | 2.0 | 2.9 | 3.1 |
| **POLYCHAETES** | | | | | | |
| *Leiochrides* sp. | | | 1 | | | |
| *Lumbrineris* sp. | | | 1 frg | 1 jv | | |
| *Lysippe annectens* | | | 5 | 12 | 2 | 1 |
| *Myriochele* sp. | | | 1 jv | 2 | | |
| *Nicomache ?lumbricalis* | | | 1 jv | | | |
| *Notomastus ?lobatus* | | | 5 lg | 7 | | |
| *Paraonis gracilis* | | | 6 | 5 | | 1 |
| *Pherusa* cf. *collarifera* | | | 1 | 2 | 3 | |
| *Praxillella ?trifila* | | | 1 | | | |
| ?*Potamethus* sp. | | | 1 jv | | | |
| *Prionospio ?pinnata* | | | 1 frg | | | 1 jv |
| *Rhodine bitorquata* | | | 1 | | | 1 |
| *Spiophanes fimbriata* | | | 2 | | | |

## TANNER CANYON *(Continued)*

| Station number | 6835 | 6836 | 6834 | 6837 | 6833 | 6832 |
|---|---|---|---|---|---|---|
| Depth in meters | 298 | 496 | 603 | 644 | 813 | 1298 |
| Kind of sediment | sand | sand, shell | mud | sand | sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.64 | 0.14 | 2.44 | 2.65 | 0.34 | 2.72 |
| Wt. of animals, gms. | 21.7 | 32.1 | 25.7 | 2.0 | 2.9 | 3.1 |
| **POLYCHAETES** | | | | | | |
| *Tharyx* sp. | | | 1 frg | | | |
| ampharetids | | | | 12 jv | | |
| *Clymenopsis cingulata* | | | | 2 | | |
| *Cossura candida* | | | | 1 jv | | |
| *Driloncreis* sp. | | | | 2 jv | 1 jv | |
| *Haploscoloplos elongatus* | | | | 4 | 4 jv | 1 |
| *Chaetozone spinosa* | | | | ?8 | 5 | 3 |
| flabelligerid | | | | 6 | | |
| *Lumbriclymene lineus* | | | | 2 | | 2 |
| *Notoproctus pacificus* | | | | 5 | | |
| *Spiophanes* sp. | | | | 1 jv | | |
| *Ampharete* sp., small | | | | | 35 | |
| ***Ampharete*** sp., lge. | | | | | 10 | |

## TANNER CANYON *(Continued)*

| Station number | 6835 | 6836 | 6834 | 6837 | 6833 | 6832 |
|---|---|---|---|---|---|---|
| Depth in meters | 298 | 496 | 603 | 644 | 813 | 1298 |
| Kind of sediment | sand | sand, shell | mud | sand | sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.64 | 0.14 | 2.44 | 2.65 | 0.34 | 2.72 |
| Wt. of animals, gms. | 21.7 | 32.1 | 25.7 | 2.0 | 2.9 | 3.1 |
| **POLYCHAETES** | | | | | | |
| *Nothria conchylega* | | | | | 1 | |
| *Praxillella gracilis* | | | | | 2 | |
| maldanid | | | | | 4 | |
| *Notomastus* sp. | | | | | 1 | 10 |
| *Goniada brunnea* | | | | | | 2 |
| harmothoid, anoculate | | | | | | 1 frg |
| *Lumbrineris limicola* | | | | | | 5 |
| *Onuphis vexillaria* | | | | | | 2 sm |
| *Paralacydonia paradoxa* | | | | | | 2 |
| *Pista ?disjuncta* | | | | | | 1 frg |
| **ECHINODERMS** | | | | | | |
| *Amphiodia urtica* | 35 | | | | | |
| *Amphiodia*, rugose | 1 jv | | | | | |

## TANNER CANYON *(Continued)*

| Station number | 6835 | 6836 | 6834 | 6837 | 6833 | 6832 |
|---|---|---|---|---|---|---|
| Depth in meters | 298 | 496 | 603 | 644 | 813 | 1298 |
| Kind of sediment | sand | sand, shell | mud | sand | sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.64 | 0.14 | 2.44 | 2.65 | 0.34 | 2.72 |
| Wt. of animals, gms. | 21.7 | 32.1 | 25.7 | 2.0 | 2.9 | 3.1 |
| **ECHINODERMS** | | | | | | |
| *Amphipholis squamata* | 48 | | 3 | | | |
| *Brissopsis pacifica* | 2 | 3 | ?1 jv | | 1 jv | |
| *Amphipholis pugetana* | | 290 | | 23 | 9 | |
| *Ophiacantha cosmica* | | 1 | | | | |
| *Ophiomusium jolliensis* | | 17 | 17 | 3 | 1 | |
| *Leptosynapta albicans* | | 1 | | 1 | | |
| ?*Ophiacantha* sp. | | 5 jv | 3 jv | 2 jv | 61 jv | |
| *Ophiopholis bakeri* | | 3 | | | | |
| *Ophiura leptoctenia* | | | 1 | | 4 | 22 |
| *Brisaster townsendi* | | | 1 | | | |
| *Echinocyamus* sp. (Fossil) | | | 1 | | | |
| *Ophiacantha phragma* | | | | 2 | | |
| *Amphiura diomedeae* | | | | | | 3 |

## TANNER CANYON *(Continued)*

| | | | | | | |
|---|---|---|---|---|---|---|
| Station number . . . . . | 6835 | 6836 | 6834 | 6837 | 6833 | 6832 |
| Depth in meters . . . . . | 298 | 496 | 603 | 644 | 813 | 1298 |
| Kind of sediment . . . . | sand | sand, shell | mud | sand | sand | mud |
| Gear used . . . . . . | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. . . | 1.64 | 0.14 | 2.44 | 2.65 | 0.34 | 2.72 |
| Wt. of animals, gms. . . | 21.7 | 32.1 | 25.7 | 2.0 | 2.9 | 3.1 |
| **ECHINODERMS** | | | | | | |
| *Ophiacantha normani* | | | | | | 4 |
| **MOLLUSKS** | | | | | | |
| *Cadulus* sp. | 2 | | 2 | 27 | 6 | 2 |
| ?*Crenella* sp. | 2 | | | | | |
| *Tellina carpenteri* or sp. | 3 | | | | | |
| *Turcicula bairdi* or sp. | 2 jv | | 1 lg | | | |
| gastropod, brown | 3 | | | | | |
| *Amphissa* sp. | | 2 | | | | |
| ?*Balcis* sp. | | 2 jv | | | | |
| *Dacrydium pacificum* | | 1 | | ca 40 | 4 | |
| chiton | | 9 | | | | |
| *Leda hamata* or sp. | | 1 | | 3 | 2 | |
| other mollusks | | 3 | ca 20 | | | |

## TANNER CANYON *(Continued)*

| | | | | | | |
|---|---|---|---|---|---|---|
| Station number | 6835 | 6836 | 6834 | 6837 | 6833 | 6832 |
| Depth in meters | 298 | 496 | 603 | 644 | 813 | 1298 |
| Kind of sediment | sand | sand, shell | mud | sand | sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.64 | 0.14 | 2.44 | 2.65 | 0.34 | 2.72 |
| Wt. of animals, gms. | 21.7 | 32.1 | 25.7 | 2.0 | 2.9 | 3.1 |
| **MOLLUSKS** | | | | | | |
| *Cylichnella* sp. | | | 1 | | | |
| *Crystallophrisson* spp. | | | 2 | 6 | | 3 |
| *Prochaetoderma* sp. | | | 1 | | | |
| ?*Margarites* sp. | | | | 3 | 2 | |
| gastropods | | | | 5 | | 1 |
| pelecypods, small | | | | 100+ | 6 | 11 |
| **CRUSTACEANS** | | | | | | |
| amphipods | 27 | 52 | 4 | 9 | 40 | 11 |
| caprellid | | | | 1 | | |
| isopod, anthurid | 1 | | | | | |
| munnid | | | | | 3 | |
| other kinds | | | | | 3 | 13 |
| broad, depressed | | | | | 3 | |

## TANNER CANYON *(Continued)*

| Station number | 6835 | 6836 | 6834 | 6837 | 6833 | 6832 |
|---|---|---|---|---|---|---|
| Depth in meters | 298 | 496 | 603 | 644 | 813 | 1298 |
| Kind of sediment | sand | sand, shell | mud | sand | sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.64 | 0.14 | 2.44 | 2.65 | 0.34 | 2.72 |
| Wt. of animals, gms. | 21.7 | 32.1 | 25.7 | 2.0 | 2.9 | 3.1 |
| **CRUSTACEANS** | | | | | | |
| tanaid | | 3 | 2 | 1 | | |
| ostracod, ridged | 7 | | | | | |
| others | | 11 | 1 | 1 | 4 | |
| cumaceans | | | | | | |
| *Campylaspis canaliculata* | | | 1 | 1 | | |
| *Campylaspis* sp., hirsute | | | | | 1 | |
| mysid | 5 | | | | | |
| spider crab, small | | | 1 | 2 | | |
| **OTHERS** | | | | | | |
| anemone, ?*Harenactis* and others | 5 | | 1 | 1 | | |
| bryozoans | some | | | | | |
| nemerteans | | 3 lg | 3 sm | 5 | | 1 frg |
| sipunculids | | 2 | | | | 13 |

## TANNER CANYON *(Continued)*

| Station number | 6835 | 6836 | 6834 | 6837 | 6833 | 6832 |
|---|---|---|---|---|---|---|
| Depth in meters | 298 | 496 | 603 | 644 | 813 | 1298 |
| Kind of sediment | sand | sand, shell | mud | sand | sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.64 | 0.14 | 2.44 | 2.65 | 0.34 | 2.72 |
| Wt. of animals, gms. | 21.7 | 32.1 | 25.7 | 2.0 | 2.9 | 3.1 |
| **OTHERS** | | | | | | |
| polyclad | | 1 | | | | |
| enteropneust | | | 1 | 4 | | |

## TANNER CANYON *(Continued)*

| | | | | | | |
|---|---|---|---|---|---|---|
| Station number | 6835 | 6836 | 6834 | 6837 | 6833 | 6832 |
| Depth in meters | 298 | 496 | 603 | 644 | 813 | 1298 |
| Kind of sediment | sand | sand, shell | mud | sand | sand | mud |
| Gear used | CG | CG | CG | CG | CG | CG |
| Vol. of sample, cu. ft. | 1.64 | 0.14 | 2.44 | 2.65 | 0.34 | 2.72 |
| Wt. of animals, gms. | 21.7 | 32.1 | 25.7 | 2.0 | 2.9 | 3.1 |
| **NUMBERS OF** | | | | | | |
| **POLYCHAETES** | | | | | | |
| Species | 18 | 15 | 22 | 27 | 15 | 19 |
| Specimens | 64 | 62 | 71 | 135 | 83 | 41 |
| **ECHINODERMS** | | | | | | |
| Species | 4 | 7 | 7 | 5 | 5 | 3 |
| Specimens | 86 | 320 | 27 | 31 | 76 | 29 |
| **MOLLUSKS** | | | | | | |
| Species | 5 | 6 | 7 | 7+ | 5 | 4+ |
| Specimens | 12 | 18 | ca 27 | 184+ | 20 | 17 |
| **CRUSTACEANS** | | | | | | |
| Species | 4 | 3 | 5 | 6 | 6+ | 3 |
| Specimens | 40 | 66 | 9 | 15 | 54 | 24 |
| **OTHERS** | | | | | | |
| Species | 1+ | 3 | 3 | 3 | 0 | 2 |
| Specimens | 5+ | 6 | 5 | 10 | 0 | 14 |
| **TOTALS** | | | | | | |
| Species | 32+ | 34 | 43 | 48+ | 31+ | 31+ |
| Specimens | 207+ | 472 | 139 | 375+ | 233 | 125 |

TANNER CANYON *(Continued)*

| Station number . . . . . | 6835 | 6836 | 6834 | 6837 | 6833 | 6832 |
|---|---|---|---|---|---|---|
| Character of the screenings | ¾ gal. white shelly sand, squid beaks, siliceous sponge, animals | small amount of red-brown shells, siliceous sponge, animals | 1+ gal. shelly sand, squid beaks, sponge, dead shells, animals | ¼ gal. shell, sand, dead *Pecten*, pitch lumps, sponge, animals | small amount debris, sponge, animals | nr ½ gal. debris, coarse brown sponge, ophiuroids, worms |
| Largest species | *Brissopsis pacifica* | *Brissopsis pacifica* | *Melinnexis* | none | none | *Pista ?disjuncta* |
| Most abundant or conspicuous species | *Chloeia*, *Amphipholis squamata* | *Amphipholis pugetana* | *Ophiomusium jolliensis*, *Terebellides* | *Dacrydium*, *Cadulus*, *Amphipholis pugetana* | *Ampharete*, *Chloeia* | sipunculids |

## LITERATURE CITED

BARNARD, J. L.

1959. Liljeborgiid amphipods of southern California coastal bottoms with a revision of the family. Pac. Nat., 1(4):12-28, figs. 1-12, charts 1-3.

1959. The common pardaliscid Amphipoda of southern California, with a revision of the family. Pac. Nat., 1(12):36-43, figs. 1-4.

1960. New bathyal and sublittoral ampeliscid Amphipods from California, with an illustrated key to Ampelisca. Pac. Nat., 1(16):1-36, figs. 1-11.

1962. Benthic marine Amphipoda of southern California. Pac. Nat., 3(1/3):1-163, figs. 1-23.

BARNARD, J. L., and R. R. GIVEN

1961. Morphology and ecology of some sublittoral Cumacean Crustacea of southern California. Pac. Nat., 2(3):153-165, figs. 1-4.

BARNARD, J. L., and OLGA HARTMAN

1959. The sea bottom off Santa Barbara, California: Biomass and community structure. Pac. Nat., 1(6):1-16, figs. 1-7.

BARNARD, J. L., and F. C. ZIESENHENNE

1961. Ophiuroid communities of southern California coastal bottoms. Pac. Nat., 2(2):131-152, figs. 1-8.

EMERY, K. O.

1960. The sea off southern California. 366p., 247 figs. Wiley, New York.

EMERY, K. O., and JOBST HÜLSEMANN

1962. The relationships of sediments, life and water in a marine basin. Deep-sea Res., 8:165-180, 10 figs.

FISHER, W. K.

1946. Echiuroid worms of the north Pacific Ocean. U. S. Natl. Mus., Proc., 96:215-292, pls. 20-37.

1949. Additions to the echiuroid fauna of the north Pacific Ocean. U. S. Natl. Mus., Proc., 99:479-497, pls. 28-34.

1952. The sipunculid worms of California and Baja California. U. S. Natl. Mus., Proc., 102:371-450, fig. 87, pls. 18-39.

HARTMAN, OLGA

1955. Quantitative survey of the benthos of San Pendro basin, southern California. Pt. I. Preliminary results. Allan Hancock Foundation Pacific Expeds., 19:1-185, 7 pls.

1956. Contributions to a biological survey of Santa Monica Bay, California. A final report submitted to Hyperion Engineers, Inc. 161p. (multilithed)

1961. Polychaetous annelids from California. Allan Hancock Foundation Pacific Expeds., 25, 226p., 35 pls.

1961. New Pogonophora from the eastern Pacific Ocean. Pac. Sci., 15:542-546, 8 figs.

1961. A new monstrillid copepod parasitic in capitellid polychaetes in southern California. Zool. Anz., 167:325-334, 1 pl., 1 chart.

*in press*. Benthic biology of the mainland shelf of southern California. *In* California. State Water Pollution Control Board. A Biological and Oceanographical Survey of the Southern California Mainland Shelf.

HARTMAN, OLGA, and J. L. BARNARD

1958-60. The benthic fauna of the deep basins off southern California. Allan Hancock Foundation Pacific Expeds., 22:1-297, 21 pls., chart, map.

LIMBAUGH, CONRAD, and F. P. SHEPARD

1957. Submarine canyons. *In* Treatise on Marine Ecology and Paleoecology. Geol. Soc. America, Mem., 67, 1:633-639, 2 pls.

MENZIES, R. J., and J. L. BARNARD

1959. Marine Isopoda on coastal shelf bottoms of southern California: Systematics and ecology. Pac. Nat., 1(11):3-35.

PECKHAM, V. O., and J. H. MCLEAN

1961. Biological exploration at the head of the Carmel submarine canyon. [Abstr.] Amer. Malacol. Union, Ann. Rpt. 1961:43.

SHEPARD, F. P., and K. O. EMERY

1941. Submarine topography off the California coast. Geol. Soc. America, Spec. Pap., 31, 171p.

# INDEX

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 27 PART 3

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## PART III

## SYSTEMATICS: POLYCHAETES

BY

OLGA HARTMAN

UNIVERSITY OF SOUTHERN CALIFORNIA PRESS
LOS ANGELES, CALIFORNIA
1963

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 27 PART 3

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## PART III

## SYSTEMATICS: POLYCHAETES

BY

OLGA HARTMAN

UNIVERSITY OF SOUTHERN CALIFORNIA PRESS
LOS ANGELES, CALIFORNIA
1963

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## Part III

## SYSTEMATICS
## POLYCHAETES, *by* OLGA HARTMAN

Allan Hancock Pacific Expeditions

Volume 27
Part III

Issued June 21, 1963
Price $2.25

University of Southern California Press
Los Angeles, California

# CONTENTS

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA
# POLYCHAETOUS ANNELIDS

By Olga Hartman

This systematic report lists the polychaetes recovered from the submarine canyons of southern California which are given in the ANALYSES (see Part 2). Each is named with its occurrence by canyon, depth in meters and numbers of individuals in a sample. More complete bibliographic citations may be consulted in reports by Hartman (1959-1961). I am indebted to Mr. Anker Petersen for the preparation of the illustrations.

The names and locations of canyons may be consulted in Part 2.

Six new species or subspecies are described; they are:

*Ancistrosyllis breviceps,* n.sp., family PILARGIDAE
*Aricidea lopezi rubra,* n. subsp., family PARAONIDAE
*Chaetozone armata,* n.sp., family CIRRATULIDAE
*Asclerocheilus californicus,* n.sp., family SCALIBREGMIDAE
*Barantolla americana,* n.sp., family CAPITELLIDAE
*Decamastus gracilis,* n.gen. and sp., family CAPITELLIDAE

Four other species are newly recorded from the eastern Pacific Ocean; they are:

*Marphysa belli oculata,* previously known from southern Florida and the West Indian region.
*Dorvillea atlantica,* previously reported off the Azores, in 1000 fms.
*Aricidea (Aedicira),* nr *fauveli,* previously reported off Morocco and the Mediterranean Sea.
*Asychis gotoi* Izuka, previously known from Japan.

Some other genera, represented by unknown species are:

*Antinoella,* in longshore canyons, in deep water.
*Harmothoë,* with reticulated elytra, in longshore canyons.
*Harmothoë,* commensal with other polychaetes, in Catalina canyon.
*Pholoë,* in Coronado canyon, deep water.
*Pareurythoë,* in Redondo and La Jolla canyons, deep water.
*Lumbrineris,* in Dume canyon, deep water.
*Aricidea (Aedicira),* from San Diego trench and Santa Cruz canyon, deep water.

*Prionospio,* in Redondo canyon, deep water.
phyllochaetopterid, in Redondo canyon.
*Flabelligera,* in Santa Cruz canyon, deep water.
flabelligerid, in Redondo and Tanner canyons, deep water.
*Ampharete,* in Tanner canyon, deep water.

## Family APHRODITIDAE

### **Aphrodita refulgida** Moore, 1910

Hueneme cn, in 456 m (1).

### **Aphrodita japonica** Marenzeller, 1879

Redondo cn, axis, in 431 m (1 large), 611 m (1 large posterior end).

San Pedro sea valley, in 459 m (1 large, measures 36 by 28 mm).

La Jolla cn, in 121 m (1, measures 23 mm across).

### **Aphrodita** spp.

Santa Monica cn, in 542 m (1, eviscerated).

San Clemente rift valley, in 1406 m (1 jv).

## Family POLYNOIDAE

### **Antinoella anoculata** (Moore) 1910

Santa Cruz cn, in 902 m (3).

### **Antinoella** sp., probably unknown

Mugu cn, in 367 mm (1), 573 m (6).

Dume cn, in 741 m (1 fragment).

Redondo cn, axis, in 422 m (1 fragment), fan, 652 m (1 fragment).

San Pedro sea valley, in 468 m (5).

Newport cn, in 553 m (1), 642 m (1 fragment).

This species is characterized by the presence of prostomial eyes and a patch of small punctate spots on the posterior half of the prostomium; length is usually less than 10 mm.

### **Evarnella fragilis** (Moore) 1910

Redondo cn, south wall, in 542 m (1).

### **Harmothoë crassicirrata** Johnson, 1897

San Clemente rift valley, in 950 m (1).

### **Harmothoë, nr lunulata** (delle Chiaje) 1841

Dume cn, in 374 m (1), 398 m (1).

Santa Monica cn, in 362 m (1).

Redondo cn, south wall, in 57 m (10), north wall, 107 m (8), 363 m (1), axis, 148 m (1), 344 m (2), 378 m (2), 503 m (2).

San Pedro sea valley, in 319 m (3).

Newport cn, in 16 m (8), 37 m (5), 178 m (3), 211 m (2).

La Jolla cn, in 79 m (2), 121 m (1).

Coronado cn, in 123 m (3).

Catalina cn, in 362 m (2).

A specimen from Redondo cn, in 344 m, contains an endoparasitic copepod.

**Harmothoë priops** Hartman, 1961

Mugu cn, in 119 m (2).

Redondo cn, in 137 m (1).

Newport cn, in 16 m (8), 37 m (2), 85 m (3), 170 m (2).

La Jolla cn, in 79 m (3).

**Harmothoë scriptoria** Moore, 1910

Santa Cruz cn, in 89 m ( ? 3).

**Harmothoë imbricata** (Linnaeus) 1767

Catalina cn, in 216 m ( ? 1).

**Harmothoë** sp., with reticulated elytra

Mugu cn, in 378 m (2).

Dume cn, in 398 m (1), 374 m (2), 398 m (1).

Redondo cn, in 232 m (1), 107 m (6), 120 m (9), 122 m (12), 146 m (5 jv), 167 m (4), 310 m (2).

San Pedro sea valley, in 221 m (5).

Newport cn, in 170 m (1), 211 m (3).

This species resembles *Harmothoë,* nr *lunulata,* above, but differs consistently in that elytra have a reticulated color pattern instead of a dark crescent. It is perhaps commensal with a maldanid, *Praxillella affinis pacifica,* with which it is usually associated.

**Harmothoë** spp.

Monterey cn, in 168 m (2), 260 m (7).

Hueneme cn, in 209 m (1), 397 m (7).

Mugu cn, in 119 m (1), 177 m (5).

Dume cn, in 299 m (1).

Santa Monica cn, in 268 m (3).

Redondo cn, south wall, in 378 m (1 fragment), north wall, 113 m (1 jv), axis, 239 m (1), 282 m (4), 298 m (1 fragment), slope, 334 m (1).

Newport cn, in 178 m (1), 478 m (1 fragment).

La Jolla cn, in 371 m (1 jv).

Coronado cn, in 177 m (1).

Catalina cn, in 379 m (1 fragment).

Tanner cn, in 496 m (2), 644 m (1 small), 1298 m (1, without eyes).

**Harmothoë** sp., unknown commensal

Catalina cn, in 88 m (7).

The body is broadly depressed, very smooth and flat dorsally. Elytra are glistening pearly white and have a slight crescentic dorsal pigment pattern. Under high magnification the margin is slightly fimbriated, with a few widely spaced short filaments along a short outer margin. The entire upper surface is covered with clear lenticles which appear as very minute granules under low magnification. The body is broadly covered with the imbricating elytra except for a short, 2 to 4 segments, posterior end. The body terminates in a pair of long, pygidial filaments.

The prostomium has peaks directed forward. The four equally small eyes are in trapezoidal arrangement, with the anterior pair located in front of the middle and at the sides of the lobe; the posterior eyes are near the posterior margin of the prostomium.

Notopodial setae are all of one kind and coarser and much shorter than the neuropodial setae. Each is acicular, has a straight, blunt tip and the sides are lightly spinous but appear smooth under low power; they form a spreading fascicle. Neuropodial setae are longer, slenderer, all about equally thick and of two kinds. The supra-acicular setae are long, spinose at the free end, and the subacicular setae are much shorter, smoother and have the cutting edge oblique, adorned with a row of short spinules.

harmothoid, not generically identified

Santa Monica cn, trawled in 100 fms, rocky bottom (1).

Tanner cn, in 496 m (2).

All elytra have been lost. The prostomium has peaks at its anterior margin. The four eyes are large, with the anterior pair at the midlength of the lobe, and the posterior eyes at the posterior margin of the prostomium. Notopodial setae are much coarser than neuropodial setae and transversely spinous. Neuropodials are of two kinds: the superior are longer, slenderer, distally deeply bifid and spinous along their free length, whereas the inferior ones are much shorter and thicker, distally entire and have few or no spinules along the cutting

edge. They intergrade near the middle of the fascicles, and from anterior to posterior regions of the body.

**Hesperonoë laevis** Hartman, 1961

Monterey cn, in 410 m (5).

Hueneme cn, in 177 m (12+), 373 m (3).

Mugu cn, in 177 m (2), 367 m (? 4).

Santa Monica cn, in 268 m (3).

Redondo cn, axis, in 246 m (1), 431 m (3), slope, 310 m (4), 167 m (1 fragment).

Newport cn, in 420 m (1).

Catalina cn, in 379 m (1).

**Lagisca multisetosa** Moore, 1902

Santa Monica cn, trawled in 200 m, rocky bottom (1+).

**Lagisca** sp.

Redondo cn, in 542 m (1), fan, 810 m (1).

San Pedro sea valley, in 461 m (1).

? **Lepidametria** sp.

Monterey cn, in 260 m (5).

This species is perhaps commensal with *Arhynchite* sp., an echiuroid worm. Elytra are very small. The prostomium has anterior peaks. The middorsum of each body segment has two erect nodes, in tandem; they appear lightly chitinized. Superiormost neuropodial setae are slenderer and more spinous than those in more inferior position. Notopodia are represented by small setal fascicles, as characteristic of *Lepidametria* and so distinguished from *Lepidasthenia.*

**Lepidasthenia interrupta** (Marenzeller) 1902

Redondo cn, in 76 m (2), possibly commensal with the maldanid, *Maldanella robusta* (see below).

**Lepidasthenia ?longicirrata** Berkeley, 1923

Monterey cn, in 168 m (6), possibly commensal with the maldanid, *Asychis disparidentata* (see below).

Hueneme cn, in 183 m (1), 177 m (1).

Dume cn, in 299 m (1).

Santa Monica cn, in 330 m (2).

Redondo cn, axis, in 298 m (1), 137 m (1 jv), 148 m (2 large, perhaps commensal with *Praxillella a. pacifica,* see below).

Newport cn, in 85 m (5 large, in tubes of *Praxillella a. pacifica*), 170 m (10 large, in tubes of the same species of maldanid), 211 m (? 3).

La Jolla cn, in 79 m (1), 121 m (4, in tubes of *Praxillella a. pacifica*).

**Lepidasthenia** spp.

Santa Cruz cn, in 221 m (4), 218 m (3), 459 m (1), 623 m (1).

**Lepidonotus caelorus** Moore, 1903

Dume cn, trawled in 40-50 fms, rocky bottom (many).

Santa Monica cn, trawled in 40-100 fms, rocky (many); 330 m (1).

Redondo cn, in 542 m (2).

Santa Cruz cn, in 218 m (10), 221 m (2), 459 m (6).

Catalina cn, in 708 m (1 jv).

**Thormora johnstoni** (Kinberg) 1855

Newport cn, in 97 m (1).

polynoids, unidentified

Redondo cn, in 422 m (2), 465 m (2), 556 m (2), 575 m (1), 686 m (1).

San Pedro sea valley, in 406 m (1).

## Family POLYODONTIDAE

**Panthalis pacifica** Treadwell, 1914

Redondo cn, in 120 m (1), 122 m (1).

San Pedro sea valley, in 187 m (2), dredged in 240-280 m (4).

La Jolla cn, in 79 m (2 jv).

Coronado cn, in 123 m (1).

**Peisidice aspera** Johnson, 1897

Dume cn, trawled in 40-50 fms, rocky (many).

Santa Monica cn, trawled in 40-100 fms, rocky (many), 116 m (2).

San Pedro sea valley, in 459 m (1).

La Jolla cn, in 121 m (1), 274 m (1).

Santa Cruz cn, in 218 m (13), 221 m (8).

## Family SIGALIONIDAE

**Leanira alba** Moore, 1910

San Diego trench, in 840 m (1).

Coronado cn, in 812 m (1).

**Leanira calcis** Hartman, 1960

Redondo cn, north wall, in 120 m (?3).

**Leanira** sp.

Newport cn, in 741 m (1 fragment).

**Pholoë glabra** Hartman, 1961

Monterey cn, in 168 m (2).

Hueneme cn, in 98 m (1), 99 m (1), 338 m (1), 456 m (1).

Mugu cn, in 119 m (3), 177 m (13).

Santa Monica cn, in 183 m (2 jv), 268 m (2).

Redondo cn, south wall, in 57 m (149+), 76 m (1), north wall, 107 m (60), 113 m (11), 120 m (22), 122 m (16), axis, 137 m (14), 146 m (2), 148 m (1), slope, 167 m (14), 232 m (2), 282 m (1 fragment), 310 m (7), fan, 652 m (1 fragment).

San Pedro sea valley, in 221 m (13).

Newport cn, in 97 m (8), 170 m (3), 178 m (12), 235 m (1 fragment).

La Jolla cn, in 79 m (6), 121 m (6).

Coronado cn, in 123 m (7), 177 m (5).

Santa Cruz cn, in 89 m (5), 218 m (1), 221 m (1).

Catalina cn, in 88 m (30), 914 m (1 small).

**Pholoë**, perhaps unknown species

Coronado cn, in 812 m (1).

This specimen lacks prostomial eyes and has unique parapodial setae.

**Sthenelanella uniformis** Moore, 1910

Redondo cn, south wall, in 57 m (7+), 76 m (5 jv), fan, 602 m (?2).

San Pedro sea valley, dredged in 50-150 fms (50+), 221 m (56).

Newport cn, in 16 m (2), 47 m (97).

La Jolla cn, in 79 m (3).

Coronado cn, in 123 m (1).

Santa Cruz cn, in 89 m (3).

**Sthenelais tertiaglabra** Moore, 1910

Mugu cn, in 119 m (2).

Santa Monica cn, in 454 m (1).

Redondo cn, in 107 m (7), 120 m (1), 122 m (2), 167 m (1).

Newport cn, in 97 m (2).

La Jolla cn, in 79 m (2).

Coronado cn, in 177 m (1).

### **Sthenelais verruculosa** Johnson, 1897

Mugu cn, in 119 m (1).
San Pedro sea valley, dredged in 240-280 m (1).

### **Sthenelais** sp.

Newport cn, in 16 m (1 jv).

### **Thalenessa spinosa** (Hartman) 1939

Hueneme cn, in 373 m (10+, large).
Mugu cn, in 119 m (12).
San Pedro sea valley, dredged in 50-150 fms (4).
Santa Cruz cn, in 89 m (2).
Tanner cn, in 298 m (3).

## Family PISIONIDAE

### **Pisione,** nr **remota** (Southern) 1914

Tanner cn, in 298 m (? 1).

## Family AMPHINOMIDAE

### **Chloeia pinnata** Moore, 1911

Monterey cn, in 168 m (36), 260 m (14).

Hueneme cn, in 165 m (10 large), 177 m (6), 338 m (5), 376 m (12 large), 456 m (8).

Dume cn, in 374 m (1).

Mugu cn, in 177 m (39), 378 m (27), 676 m (10 large).

Santa Monica cn, in 183 m (1), 268 m (1), 330 m (2), 362 m (14).

Redondo cn, south wall, in 57 m (150+), 76 m (1), 107 m (10), 113 m (1), 120 m (24), 122 m (22), axis, 137 (126 large), 148 m (25), 167 m (33), 232 m (28), 239 m (61), 246 m (4), 298 m (55), 310 m (9), 344 m (20+), 378 m (20 large and small), 378 m (37 small), 422 m (about 90), 431 m (1).

San Pedro sea valley, in 187 m (1), 221 m (410), 240-280 m, dredged (many), 406 m (27 jv), 438 m (11), 459 m (35 large), 461 m (117), 468 m (2), 480 m (116), 522 m (1).

La Jolla cn, in 79 m (31 jv), 121 m (1 jv), 135 m (1 jv), 274 m (1 large and 8 jv), 371 m (1 large), 517 m (3 large), 637 m (5 large), 793 m (1 jv).

Coronado cn, in 177 m (3).

Catalina cn, in 362 m (1 jv).

Tanner cn, in 298 m (15), 813 m (10).

Large individuals measure about 35 mm long. Greatest concentrations occur in Redondo canyon and San Pedro sea valley, in depths of 57 to 480 meters.

**Pareurythoë** sp., perhaps unknown

Redondo cn, in 137 m (3), 246 m (1).

La Jolla cn, in 274 m (1 jv).

The prostomial caruncle resembles that of *Pareurythoë californica* (Johnson), an intertidal form from southern California; the specific details of setae and branchiae may be different.

## Family EUPHROSINIDAE

**Euphrosine** spp.

Dume cn, trawled in 40-50 fms (1).

Redondo cn, in 542 m (1).

Santa Cruz cn, in 218 m (2).

## Family PHYLLODOCIDAE

**Anaitides,** cf. **groenlandica** (Oersted) 1843

Hueneme cn, in 397 m (1 large).

The dorsum is dark iridescent, the ventrum lighter. Dorsal cirri are large, distally truncate, dark in color and have a pale margin. Ventral cirri in median and posterior regions are long, more or less lanceolate and distally pointed. The everted proboscis has 6 paired rows of papillae with up to 8 in a row.

**Anaitides,** nr **madeirensis** (Langerhans) 1880

Hueneme cn, in 177 m (1), 376 m (13).

Santa Monica cn, in 268 m (1 large), 362 m (1).

Redondo cn, in 113 m (1 large), 167 m (1), 310 m (5).

Newport cn, in 97 m (2), 170 m (1).

Santa Cruz cn, in 459 m (2).

Tanner cn, in 496 m (1).

**Anaitides multiseriata** Rioja, 1941

San Pedro sea valley, dredged in 240-280 m (7).

**Anaitides** spp.

Santa Monica cn, in 330 m (1).

Redondo cn, in 107 m (2), 137 m (1), 148 m (2), 232 m (3), 239 m (1), 334 m (3), 344 m (1), 363 m (1), 422 m (4), 542 m (1).

San Pedro sea valley, in 221 m (1), 240-280 m (4), 406 m (1).

### **Eteone californica** Hartman, 1936

Hueneme cn, in 98 m (2), 183 m (1).
Mugu cn, in 119 m (2).
Santa Monica cn, in 330 m (1).
Redondo cn, north wall, in 113 m (1), axis, 344 m (1).
San Pedro sea valley, in 221 m ( ? 1).

### **Eteone dilatae** Hartman, 1936

Hueneme cn, in 165 m (10), 177 m (7).

### **Eteone** spp.

Hueneme cn, in 456 m (6). The dorsum and ventrum are crossed by dark bars across the middle of segments, with the same color as that on dorsal cirri; the latter are thick and appear inflated. The last segment is followed by a ring with a pair of short, thick lateral cirri and a median, slenderer, distally tapering one.

Redondo cn, axis, in 137 m (1 jv).

Newport cn, in 16 m (1 small white).

La Jolla cn, in 274 m (1 jv). The body is long and slender.

Santa Cruz cn, in 89 m (1). The dorsum has a pair of longitudinal lines.

### **Eulalia** spp.

Santa Monica cn, trawled in 40 fms (1). The body is yellow and the dorsum has 3 longitudinal rows of spots, with those on the sides larger than the middorsal one.

Monterey cn, in 168 m (1). The dorsum has 3 longitudinal rows of dark stripes.

Mugu cn, in 119 m (1).

San Pedro sea valley, dredged in 180-430 m (7).

Redondo cn, in 137 m (1).

### **Eumida sanguinea** (Oersted) 1843

Mugu cn, in 119 m (1), 177 m (1).
Redondo cn, in 57 m (1).

### **Eumida bifoliata** (Moore) 1909

Tanner cn, in 496 m (1). An adult individual with reddish brown ova deposited in an ampharetid tube in which the adult is lodged.

### **Eumida tubiformis** Moore, 1909

Dume cn, in 398 m ( ? 1).

**Eumida** spp.

Santa Monica cn, in 116 m (3).

Redondo cn, in 57 m (1), 232 m (1), 246 m (1), 310 m (1), 542 m (1).

San Pedro sea valley, in 187 m (1), 459 m (1).

Newport cn, in 16 m (1), 170 m (1), 235 m (1), 211 m (1), 272 m (2).

La Jolla cn, in 79 m (4), 135 m (10).

Santa Cruz cn, in 218 m (1), 221 m (1).

**Genetyllis castanea** (Marenzeller) 1879

San Pedro sea valley, dredged in 100-300 m (4).

**?Genetyllis** sp.

Mugu cn, in 119 m (2).

**Hypoeulalia bilineata** (Johnston) 1840

Santa Monica cn, trawled in 80 m, rocky bottom (1).

Redondo cn, in 542 m (1).

San Pedro sea valley, dredged in 100-300 m (7).

The body is pigmented dark mustard yellow and has a pair of lateral, longitudinal stripes and a paler middorsal one. The fusion of prostomium and first segment is less complete than in typical form.

**Paranaitis polynoides** (Moore) 1909

Santa Monica cn, in 116 m (1).

La Jolla cn, in 121 m (1), 274 m (2 jv).

**Phyllodoce** spp.

Mugu cn, in 119 m (3), 177 m (1).

Redondo cn, in 57 m (3+).

Newport cn, in 37 m (1), 235 m (2).

La Jolla cn, in 79 m (15), 121 m (4), 274 m (9).

Santa Cruz cn, in 218 m (1 jv).

Catalina cn, in 559 m (1 fragment).

## Family LACYDONIIDAE

**Paralacydonia paradoxa** Fauvel, 1913

Tanner cn, in 1298 m (2).

## Family HESIONIDAE

### **Amphiduros pacificus** Hartman, 1961

Hueneme cn, in 383 m ( ? 1 fragment).

Redondo cn, in 246 m ( ? 1 fragment), 503 m ( ? 3), 611 m ( ? 1).

San Pedro sea valley, in 459 m ( ? 1).

### **Ophiodromus pugettensis** (Johnson) 1901

Hueneme cn, in 177 m (2).

Santa Monica cn, in 116 m (12).

Redondo cn, in 146 m (1).

San Pedro sea valley, dredged in 100-300 m (4).

### **Oxydromus arenicolus glabrus** Hartman, 1961

Hueneme cn, in 165 m (2), 183 m (1), 271 m (1), 373 m (1), 376 m (1), 397 m (1), 478 m (1).

Dume cn, in 374 m (1).

Mugu cn, in 548 m (8).

Santa Monica cn, in 183 m (2 jv), 330 m (1).

Redondo cn, south wall, in 57 m (3), 232 m (1), 575 m (2), north wall, 107 m (1), 113 m (3), 120 m (1), 363 m (2), axis, 137 m (28), 431 m (2), slope, 556 m (1), fan, 652 m (1), 660 m (4).

San Pedro sea valley, in 319 m (1), 522 m (1), 661 m (4).

Newport cn, in 16 m (1), 37 m (1), 85 m (4), 97 m (15), 235 m (4), 478 m (1), 553 m (5).

La Jolla cn, in 79 m (6), 121 m (3), 274 m (1), 371 m (1).

Coronado cn, in 123 m (2).

Catalina cn, in 266 m (1), 362 m (1), 379 m (2).

### ?**Oxydromus** sp.

Hueneme cn, in 271 m (1), 373 m (1), 376 m (1), 478 m (1).

Mugu cn, in 573 m (8), 755 m (1).

Santa Monica cn, in 463 m (1), 542 m (1).

Redondo cn, south wall, in 378 m (4 fragments), axis, 282 m (3), 378 m (3 fragments), fan, 602 m (1).

Newport cn, in 741 m (1).

Catalina cn, in 559 m (1 jv).

### hesionids, not identified

Mugu cn, in 721 m (2).

Santa Monica cn, trawled in 200 m, rocks (2).

San Pedro sea valley, in 716 m (1).

Newport cn, in 37 m (4), 478 m (1 fragment).

## Family PILARGIDAE

### **Ancistrosyllis tentaculata** Treadwell, 1941

Monterey cn, in 168 m (4).

Hueneme cn, in 177 m (1), 183 m (2), 209 m (2), 338 m (1), 456 m (1).

Mugu cn, in 548 m (4).

Dume cn, in 580 m (1), 905 m (2).

Santa Monica cn, in 116 m (2), 183 m (1), 454 m (1), 542 m (1), 583 m (2).

Redondo cn, south wall, in 232 m (8), 519 m (3), 575 m (1), north wall, 107 m (8), 113 m (17), 122 m (1), 363 m (3), axis, 137 m (more than 238), 148 m (50), 239 m (2), 246 m (12), 209 m (2), 298 m (2), 344 m (1), 503 m (1), fan, 344 m (1), 652 m (1), 786 m (2).

San Pedro sea valley, in 187 m (17), 522 m (1), 661 m (1), 666 m (1), 716 m (1).

Newport cn, in 16 m (8), 37 m (Sta. 5006) (31), 37 m (Sta. 5250) (67), 85 m (265, large and small), 97 m (72), 170 m (19), 178 m (1), 235 m (12), 272 m (2).

La Jolla cn, in 79 m (69), 121 m (2), 545 m (1), 793 m (? 1, very dark), 976 m (? 3, very dark).

Coronado cn, in 566 m (1).

Catalina cn, in 559 m (3).

### **Ancistrosyllis breviceps,** new species

Fig. 1a-d

Hueneme cn, in 397 m (1).

Mugu cn, in 177 m (1), 548 m (1 fragment).

Dume cn, in 580 m (2).

Santa Monica cn, in 268 m (1), 475 m (2), 542 m (1 fragment), 583 m (2), 612 m (1 fragment), 695 m (1, HOLOTYPE).

Redondo cn, in 246 m (1 fragment), 282 m (1), 378 m (1), 431 m (1), 503 m (1), 660 m (2), 686 m (2), 751 m (1), 786 m (3, dark green).

San Pedro sea valley, in 319 m (1 fragment), 459 m (1), 661 m (1), 666 m (1), 716 m (1), 740 m (1).

Newport cn, in 215 m (1), 420 m (1).

La Jolla cn, in 545 m (1).

Coronado cn, in 344 m (3), 566 m (2), 960 m (2).

Catalina cn, in 216 m (1), 266 m (1), 362 m (1), 379 m (2+), 559 m (1).

A complete individual in two pieces measures 32 mm long and 4 mm wide with parapodia, in median segments. The body is depressed and resembles a species of *Pilargis* (see below) because antennae and cirri are very short; the median antenna is sometimes difficult to identify. The surface epithelium is minutely papillated; this is most obvious on the dorsum, the superior edges of parapodia and the dorsal cirri.

The prostomium (Fig. 1a) consists of a pair of subtriangular lobes, each a little longer than wide, well separated in front and fused at the base; there are no visible eyes. The three antennae are short, digitate and subequally short; each is about half as long as the prostomium; they are inserted near the posterior margin of the head lobe, with the laterals near the ectal margin and the median one where the prostomium and first segment join.

The first visible segment has a pair of short, subequal tentacular cirri (Fig. 1a); each is longer than an antenna and slightly papillated, seen only under magnification. The second segment, also without parapodia and setae, has a similar dorsal, and a much shorter ventral cirrus, resembling that of the third segment. The third segment, which is the first setigerous, is the most reduced; it has a small dorsal and a smaller ventral cirrus, and its setal fascicle is inconspicuous. From the fourth segment the parapodia are much larger and resemble those of the fifth and successive segments.

In typical parapodia the dorsal cirrophore encloses a slender aciculum or rod; these enlarge in median and posterior segments to form the conspicuous dorsal hooks. They increase gradually in size and are large, distally recurved, yellow crooked at about segment 18, (at segment 3, Redondo cn, fan in 751 m) but are irregular in occurrence through several segments. Where best developed (Fig. 1b) in middle and posterior segments, they emerge from the upper, basal edge of the notopodium, well within the base of the dorsal cirrus. The accompanying neuropodial setae (Fig. 1c) are much slenderer, nearly straight and directed laterally; they number 4 to 7 in a fascicle, but are frequently broken off near the base.

*Ancistrosyllis breviceps* is allied to *A. groenlandica* McIntosh (1879) (see Hartman, 1947, p. 497) from Greenland, in 410 fms, on sandy mud. It also has small prostomial antennae, a papillated epithelium and sharply crooklike notopodial hooks. The two differ in that (1) *A. breviceps* lacks eyes, (2) the first large notopodial hooks are first present at about segment 18 instead of far more anterior, (3) the paired prostomial antennae are inserted more posterior in the first than the second, (4) the dorsal cirri of the first setigerous segment

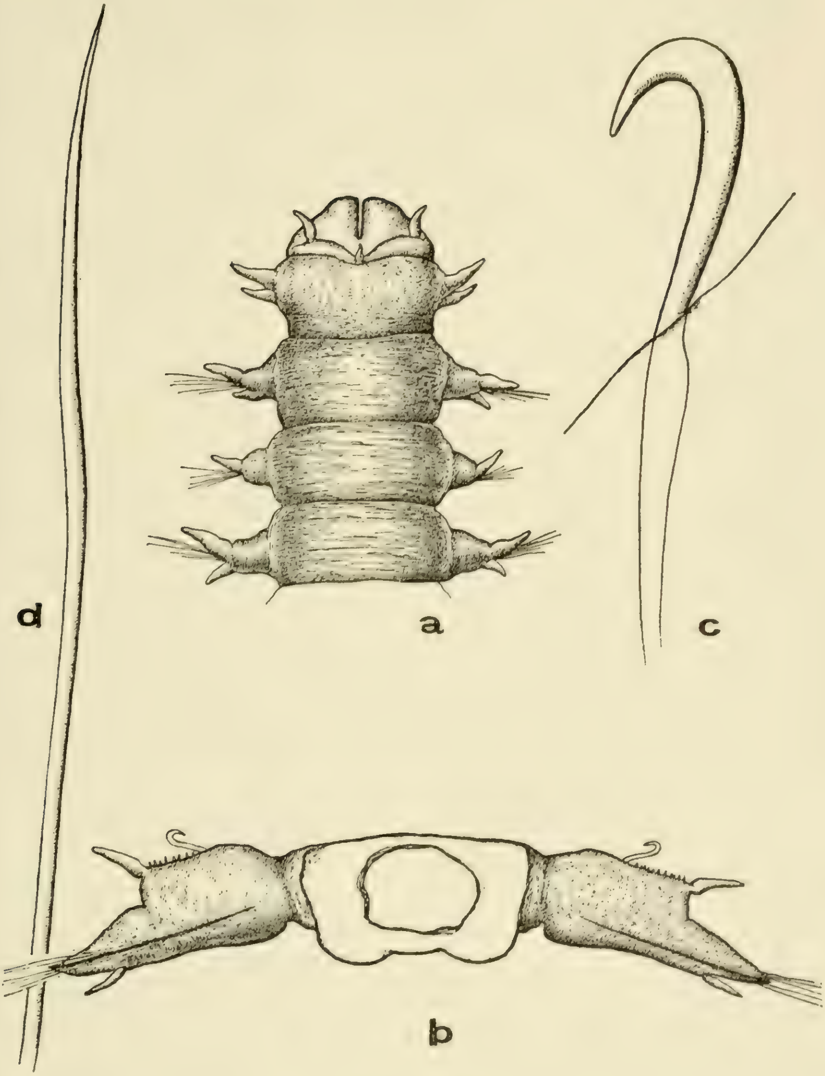



Fig. 1a-d

Fig. 1. *Ancistrosyllis breviceps,* new species (Sta. 7517-60, Santa Monica canyon, in 695 meters)

a, anterior end with prostomium and first four segments, in dorsal view, x 33.5; b, cross section of middle region of body, showing laterally directed parapodia, x 21; c, notopodial hook from median parapodium, x 355; d, neuropodial seta from same parapodium, x 355.

are much reduced in the first, not in the second, and (5) the third segment is greatly reduced in *A. breviceps,* not so in *A. groenlandica.*

The type specimen is selected from Santa Monica canyon, in 695 meters, Sta. 7517-62.

**Loandalia,** nr **fauveli** Berkeley and Berkeley, 1941

Newport cn, in 37 m (3).

**Pilargis berkeleyi** Monro, 1933

Monterey cn, in 168 m (1).

Redondo cn, in 113 m (1), axis, 246 m (1).

San Pedro sea valley, dredged in 50-150 fms (1), 187 m (4), 319 m (1).

Newport cn, in 85 m (1).

La Jolla cn, in 79 m (2), 121 m (2).

**Pilargis maculata** Hartman, 1947

Hueneme cn, in 209 m (1).

Santa Monica cn, in 362 m (1).

Redondo cn, south wall, in 57 m (1), 232 m (1), north wall, 113 m (1), axis, 148 m (1), slope, 310 m (1).

San Pedro sea valley, in 221 m (1 fragment), 319 m (1), 406 m (1).

Newport cn, in 16 m (1), 37 m (1 fragment).

La Jolla cn, in 79 m (3), 121 m (1).

**Pilargis hamatus** Hartman, 1960

Santa Monica cn, in 431 m ( ? 1).

Newport cn, in 420 m (2).

La Jolla cn, in 976 m (1).

Family SYLLIDAE

**Autolytus** spp.

Mugu cn, in 119 m (2).

Santa Monica cn, in 612 m (1).

**Calamyzas ?amphictenicola** Arwidsson, 1932

Redondo cn, in 554 m (1), attached to *Amphicteis scaphobranchiata.*

**Exogone uniformis** Hartman, 1961

Mugu cn, in 119 m (3).

Santa Monica cn, in 116 m (1), 183 m (2), 268 m (1), trawled in 200 m (3).

Redondo cn, north wall, in 107 m (12), 120 m (7), south wall, 76 m (2, with long swimming setae).

La Jolla cn, in 121 m (2).

Tanner cn, in 603 m (1), 644 m (1).

**Exogonella brunnea** Hartman, 1961

Santa Monica cn, in 330 m (3).

**Langerhansia heterochaeta** (Moore) 1909

Redondo cn, in 113 m (7).

Newport cn, in 97 m (2).

**Odontosyllis phosphorea** Moore, 1909

San Pedro sea valley, dredged in 240-280 m (4).

odontosyllids, unidentified

Santa Cruz cn, in 89 m (2), 218 m (1 fragment).

**Plakosyllis americana** Hartman, 1961

Santa Cruz cn, in 221 m (1).

**Pionosyllis,** unknown sp.

Redondo cn, slope, in 76 m (10).

**Sphaerosyllis** sp.

Mugu cn, in 119 m (5).

Coronado cn, in 566 m (1).

**Syllis** or **Typosyllis** spp.

Mugu cn, in 119 m (25), 177 m (1).

Redondo cn, north wall, in 465 m (1), south wall, 378 m (2), axis, 137 m (4).

San Pedro sea valley, in 221 m (1).

Coronado cn, in 177 m (1).

Santa Cruz cn, in 459 m (? 1).

**Typosyllis,** nr **hyalina** (Grube) 1863

Santa Monica cn, trawled in 80 m, rocky bottom (3).

syllids, unidentified

Redondo cn, south wall, in 542 m (3), axis, 148 m (1).

La Jolla cn, in 121 m (1).

Coronado cn, in 123 m (2).

Santa Cruz cn, in 218 m (1).

Catalina cn, in 708 m (1 fragment).

## Family NEREIDAE

### **Ceratocephala crosslandi americana** Hartman, 1952

Mugu cn, in 177 m (1).
Redondo cn, south wall, in 57 m (2), 232 m (1), axis, 137 m (1).
Newport cn, in 170 m (2), 478 m (1).
La Jolla cn, in 121 m (2).
Coronado cn, in 177 m (1).

### **Ceratocephala loveni pacifica** Hartman, 1960

San Diego trench, in 840 m (2).

### **Ceratonereis paucidentata** (Moore) 1903

La Jolla cn, in 517 m (2 large).

### **Nereis anoculis** Hartman, 1960

Santa Cruz cn, in 1387 m (1).

### **Nereis procera** Ehlers, 1868

Monterey cn, in 168 m (4), 260 m (2), 906 m (1).
Hueneme cn, in 383 m ( ? 1).
Mugu cn, in 119 m (8), 177 m (1).
Dume cn, in 374 m (1).
Santa Monica cn, in 116 m (8), 268 m (1), 330 m (1).
Redondo cn, south wall, 232 m (15), north wall, 107 m (1 small), 113 m (7), 363 m ( ? 1), axis, 137 m (6 large).
San Pedro sea valley, in 187 m ( ? 1), dredged in 100-300 m (many).
Newport cn, in 16 m (25), 97 m (5), 170 m (13), 178 m (1 large), 211 m (7 large).
La Jolla cn, in 79 m (43), 121 m (6).
Coronado cn, in 177 m (2).
Santa Cruz cn, in 89 m (1).

### **Nereis pelagica neonigripes** Hartman, 1936

Santa Monica cn, in 183 m (5).
Redondo cn, axis, in 298 m (1).

### **Nereis** spp.

Redondo cn, south wall, in 542 m (1 small), north wall, 363 m (1, unusually prolonged), axis, 246 m (5), 560 m (1 small), slope, 167 m (1 fragment), 310 m (4).
San Pedro sea valley, in 221 m (8).
Newport cn, in 16 m (1), 85 m (1).
Catalina cn, in 216 m (2), 266 m (1).

**Platynereis bicanaliculata** (Baird) 1863

Mugu cn, in 119 m (4).

Dume cn, dredged in 40-50 fms, rocky bottom (many).

La Jolla cn, in 135 m (12).

Family NEPHTYIDAE

**Aglaophamus dicirris** Hartman, 1950

Redondo cn, north wall, in 107 m (1), 122 m (1), axis, 503 m (7).

San Pedro sea valley, in 468 m (3).

La Jolla cn, in 121 m (1).

Catalina cn, in 88 m (15).

**Aglaophamus erectans** Hartman, 1950

Santa Monica cn, in 542 m ( ? 1 jv).

Redondo cn, axis, in 246 m (1 large), 282 m (8), 378 m (9).

San Pedro sea valley, in 319 m (1).

Newport cn, in 420 m (3).

Coronado cn, in 177 m (1), 344 m (1).

Catalina cn, in 379 m (1).

**Aglaophamus** spp.

Hueneme cn, in 397 m (1 fragment).

Dume cn, in 299 m (1 small).

Redondo cn, axis, in 344 m (1), slope, 334 m (2).

Newport cn, in 272 m ( ? 14 jv).

La Jolla cn, in 371 m (1), 517 m (1 fragment), 545 m (2).

Coronado cn, in 1265 m (1 jv).

San Clemente cn, in 1406 m (1).

**Nephtys assignis** Hartman, 1950

Monterey cn, in 260 m (1), 410 m (2 large and 3 very small, the largest one has a regenerated tail and measures 140 mm long by 10 mm wide).

San Pedro sea valley, in 221 m (1).

Newport cn, in 178 m (2 large).

**Nephtys cornuta** Berkeley and Berkeley, 1945

Monterey cn, in 750 m (17, characterized by bifid ventral prostomial antennae).

Redondo cn, axis, in 560 m (2, ovigerous, only 5.2 mm long by 0.6 mm wide).

**Nephtys caecoides** Hartman, 1938

Hueneme cn, in 98 m (?5).
Mugu cn, in 119 m (3).
Newport cn, in 16 m (13).

**Nephtys californiensis** Hartman, 1938

Redondo cn, south wall, in 57 m (?21).

**Nephtys ferruginea** Hartman, 1940

Hueneme cn, in 177 m (2 small), 338 m (3), 376 m (2 small), 456 m (3).

Mugu cn, in 119 m (1), 367 m (4 small), 378 m (4 small).

Redondo cn, south wall, in 232 m (2), north wall, 107 m (12), 113 m (2), 120 m (9), 122 m (15), 146 m (21), axis, 148 m (4), 344 m (?14), slope, 167 m (10).

San Pedro sea valley, 187 m (2 jv), dredged in 100-300 m (5), 221 m (16), 319 m (?7 small).

Newport cn, in 37 m (2), 97 m (2), 178 m (3), 211 m (1), 235 m (1).

La Jolla cn, in 79 m (2), 121 m (5).

Coronado cn, in 123 m (4 jv), 177 m (9), 344 m (3), 566 m (3 small).

Catalina cn, in 216 m (3), 379 m (?12 jv).

**Nephtys glabra** Hartman, 1950

Hueneme cn, in 376 m (1 large).
Mugu cn, in 177 m (10).
San Pedro sea valley, dredged in 100-300 m (2 very large).

**Nephtys** spp.

Hueneme cn, in 209 m (3), 383 m (2 small), 397 m (9 jv), 456 m (12).

Mugu cn, in 119 m (2), 573 m (1 jv), 676 m (1 jv).

Santa Monica cn, in 268 m (2 jv), 330 m (8 jv).

Redondo cn, south wall, in 378 m (12 jv), 575 m (8), north wall, 120 m (15 jv), 363 m (3 small), axis, 137 m (5 jv), 298 m (5 jv).

San Pedro sea valley, in 187 m (1 jv).

Newport cn, in 85 m (2 jv), 211 m (15 jv), 235 m (59 jv), 272 m (11), 478 m (5), 553 m (4 jv).

La Jolla cn, in 637 m (15 small).

Santa Cruz cn, in 221 m (2 jv).

Catalina cn, in 362 m (5 small).

Eight individuals from Redondo canyon, in 575 m, are small, measure 7 to 10 mm long and are ovigerous. Interramal cirri are first present from the fifth setigerous segment. Pre-acicular setae are smooth, not camerated. These, as well as some others named from deep water, may represent an undescribed species.

nephtyids, unidentified

Dume cn, in 530 m (1 small).
Santa Monica cn, in 475 m (1 jv).
Redondo cn, in 431 m (2 jv).
San Pedro sea valley, in 406 m (12 small).
Catalina cn, in 266 m (4 fragments).

## Family SPHAERODORIDAE

**Sphaerodorum brevicapitis** Moore, 1909

San Clemente rift valley, in 1591 m (1).

**Sphaerodorum papillifer** Moore, 1909

Santa Monica cn, trawled in 200 m, rocky bottom (1).

**Sphaerodorum** spp.

Tanner cn, in 496 m (2), 1298 m (3).

These individuals differ from *Sphaerodorum brevicapitis* (above) in that the large parapodial capsules have a distal papilla, not one near the base. The body is linear and measures about 10 mm long. Small papillae are dispersed over the dorsum and the ventrum.

**Sphaerodoridium**[1] **minutum** (Webster and Benedict) 1887

Redondo cn, north wall, in 107 m (9), 120 m (4).
La Jolla cn, in 121 m (1).
Coronado cn, in 123 m (1), 177 m (2).

**Sphaerodoridium sphaerulifer** (Moore) 1909

San Pedro sea valley, dredged in 240-280 m (5).

## Family GLYCERIDAE

**Glycera americana** Leidy, 1855

Hueneme cn, in 98 m (1), 165 m (1 large), 177 m (2), 338 m (1), 456 m (2).

Mugu cn, in 119 m (1).

Dume cn, in 398 m (1 large, weight 5 grams, and 1 small).

[1]This genus has been recently erected by Lützen, 1961.

Santa Monica cn, in 116 m (4 large, 1 small).

Redondo cn, south wall, in 232 m (2 large), 378 m (1), north wall, in 113 m (4), axis, 138 m (4, of which 2 are unusually large), 344 m (1 large), 422 m (1 large).

San Pedro sea valley, in 187 m (2 large), 319 m (1 small), dredged in 240-280 m (1 large), dredged in 100-300 m (5).

Newport cn, in 16 m (6 large), 37 m (1), 85 m (4), 97 m (3), 211 m (1).

La Jolla cn, in 79 m (2+), 121 m (1), 274 m (1).

Santa Cruz cn, in 221 m (13), 459 m (3, of which 2 are very large).

**Glycera capitata** Oersted, 1843

(Some of the following records may refer to *Glycera tenuis,* q.v.)

Monterey cn, in 168 m (7), 410 m (1), 750 m (1).

Hueneme cn, in 165 m (3), 183 m (1), 338 m (1), 376 m (1 jv), 345 m (? 1 jv).

Mugu cn, in 124 m (1), 177 m (1), 367 m (4), 378 m (1).

Dume cn, in 299 m (1), trawled in 40-50 fms (some).

Santa Monica cn, in 268 m (3), 330 m (? 1 fragment).

Redondo cn, south wall, in 57 m (14), 76 m (7 jv), 232 m (12), 378 m (1), 575 m (1 small), north wall, 107 m (8 jv), 113 m (30), 120 m (1 large and 4 small), 122 m (2), 146 m (8), axis, 137 m (10), 148 m (8 large and 6 small), 239 m (2), 246 m (1 fragment), 282 m (1), 298 m (4), 344 m (1 jv), 378 m (2 large), 431 m (? 1 small), 503 m (2), 560 m (? 3 small), slope, 167 m (5), 310 m (3).

San Pedro sea valley, in 187 m (13), 221 m (4), 319 m (1), 406 m (? 2), dredged in 240-280 m (17 small).

Newport cn, in 37 m (44), 97 m (25), 140 m (1), 170 m (18), 178 m (8), 211 m (13), 235 m (26), 272 m (20).

La Jolla cn, in 121 m (13), 135 m (? 23 jv), 517 m (3), 976 m (? 2 jv).

Coronado cn, in 123 m (6), 177 m (17 small), 813 m (? 1 small), 1265 m (? 1).

Catalina cn, in 88 m (2 jv), 216 m (4), 708 m (1 small).

San Clemente rift valley, in 950 m (? 1), 1405 m (? 2).

Tanner cn, in 603 m (2 small), 644 m (1), 1298 m (1).

**Glycera capitata branchiopoda** Moore, 1911

Mugu cn, in 573 m (1), 676 m (3).

Santa Monica cn, in 583 m (1).

Redondo cn, fan, in 825 m (1).

San Pedro sea valley, in 468 m (1 large), 716 m (1).

Newport cn, in 235 m (4), 553 m (4), 235 m (4), 642 m (3), 741 m (4).

La Jolla cn, in 793 m (3).

San Diego trough, taken in all samples.

Santa Cruz cn, in 459 m (1).

### **Glycera convoluta** Keferstein, 1862

Mugu cn, in 119 m (2).

### **Glycera oxycephala** Ehlers, 1887

Santa Cruz cn, in 89 m (4).

### **Glycera robusta** Ehlers, 1868

Hueneme cn, in 183 m (1).

Redondo cn, axis, in 137 m (1 very large), 298 m (1 jv).

San Pedro sea valley, in 221 m ( ? 1 fragment).

Newport cn, in 37 m (1 large and 1 small), 37 m (2 large), 85 m (2 large), 170 m (2 large), 211 m (1 giant, measures 250 mm long by 13 mm wide and weighs 13.4 grams).

Coronado cn, in 177 m (1 very large).

### **Glycera tenuis** Hartman, 1944

Hueneme cn, in 397 m (2).

Santa Monica cn, in 612 m (2), trawled in 200 m, rocky (4).

Newport cn, in 85 m ( ? 11 small).

### **Glycera tesselata** Grube, 1863

Redondo cn, south wall, in 76 m (3), 542 m (3).

La Jolla cn, in 637 m ( ? 7).

Santa Cruz cn, in 218 m (14).

Tanner cn, in 496 m (2).

### **Glycera** spp.

Redondo cn, axis, in 422 m (1), slope, 556 m (1 small).

Newport cn, in 38 m (15 small).

La Jolla cn, in 79 m (30 or more jv), 274 m (5 jv), 371 m (1).

Catalina cn, in 549 m (1 jv).

Tanner cn, in 298 m (2 jv), 813 m (1 jv).

## Family GONIADIDAE

### **Glycinde armigera** Moore, 1911

Santa Monica cn, in 268 m ( ? 2).

Redondo cn, in 148 m (2), 344 m (1), 363 m (2 large).

Newport cn, in 140 m (2).

**Glycinde,** nr **polygnatha** Hartman, 1950

Hueneme cn, in 177 m (2).

**Glycinde wireni** Arwidsson, 1899

Santa Monica cn, in 454 m ( ? 1).

**Glycinde** spp.

Redondo cn, axis, in 378 m (7), 422 m (1), 611 m (2 small).

San Pedro sea valley, in 406 m (3).

La Jolla cn, in 274 m (1 jv).

**Goniada acicula** Hartman, 1940

Mugu cn, in 119 m (1).

**Goniada annulata** Moore, 1905

Hueneme cn, in 373 m (2).

Santa Monica cn, in 454 m (1 large), 542 m (1).

Newport cn, in 420 m (1), 478 m (1 large and 2 small).

Anterior and median notopodial lobes are large and cordate in shape. Proboscidial papillae are tall, slender and chitinized. This species has not previously been recorded from California.

**Goniada brunnea** Treadwell, 1906

Hueneme cn, in 98 m (1), 271 m (1 large and 2 small), 338 m (3), 373 m (2), 376 m (9 large), 397 m (5).

Mugu cn, in 119 m (7), 124 m (1), 177 m (3), 367 m (3), 573 m (8).

Dume cn, in 299 m (2), 374 m (1), 398 m (3).

Santa Monica cn, in 116 m (2), 330 m (1).

Redondo cn, south wall, in 57 m (7), 76 m (2), 232 m (3), north wall, 107 m (5), 113 m (4), 120 m (2), 122 m (1 large), 146 m (2), 363 m (1 jv), axis, 137 m (9), 148 m (1), 239 m (2), 282 m (3), 298 m (2), 344 m (2), 431 m ( ? 7 large), 503 m (7), 560 m ( ? 5 jv), slope, 167 m (1), 310 m (3), 334 m (1), fan, 652 m (1).

San Pedro sea valley, in 187 m (9), 221 m (8), 319 m (1), 406 m (1), dredged in 100-300 m (44 large), dredged in 240-280 m (5+).

Newport cn, in 16 m (1), 38 m (2), 85 m (6), 170 m (9), 211 m (2), 235 m (5), 272 m ( ? 4).

La Jolla cn, in 79 m (4), 121 m (4), 135 m (3), 274 m (1 jv).

Coronado cn, in 177 m (2), 344 m (2), 812 m (1), 1105 m (1).

Catalina cn, in 88 m (1 large and 1 small), 216 m (4), 559 m (1), 914 m (4).

Tanner cn, in 1298 m (2).

**Goniada littorea** Hartman, 1950

Newport cn, in 16 m (61).
Coronado cn, in 123 m (1).



**Goniada** sp.

Santa Cruz cn, in 221 m (1).

Family ONUPHIDAE

**Diopatra ornata** Moore, 1911

Mugu cn, in 119 m (25 large).
Redondo cn, south wall, in 57 m (1).
San Pedro sea valley, in 221 m (1 jv), dredged in 100-300 m (3 jv).

**Diopatra** sp.

San Pedro sea valley, in 187 m (3).

**Hyalinoecia juvenalis** Moore, 1911

Newport cn, in 97 m (1).

**Nothria conchylega** (Sars) 1835

Catalina cn, in 708 m (1).
Tanner cn, in 813 m (1).

**Nothria elegans** (Johnson) 1901

Hueneme cn, in 177 m (1).
Newport cn, in 16 m (2 large).
La Jolla cn, in 121 m (1).

*Nothria elegans, N. iridescens* and *N. pallida* are closely related. Ecologically they may be recognized as follows: *N. elegans* occupies a limp, thin-walled, sand-covered tube and occurs in shallowest benthic bottoms. *N. iridescens* constructs a tough, chitinized, tightly fitting tube and exists in deeper bottoms. *N. pallida* constructs a thick walled, mud-covered tube and occurs in considerable depths.

**Nothria iridescens** (Johnson) 1901

Monterey cn, in 168 m (5+), 410 m (34 large).

Hueneme cn, in 383 m (6), 376 m (23), 397 m (42 large), 456 m (?2 jv).

Mugu cn, in 177 m (25), 367 m (5 large), 378 m (6).

Dume cn, in 398 m (14 large).

Santa Monica cn, in 268 m (15), 330 m (36), 362 m (24), 431 m (3).

Redondo cn, slope, in 167 m (? 1 fragment).

San Pedro sea valley, in 221 m (1), 461 m (3 large), dredged in 100 to 300 m (43+).

Newport cn, in 170 m (14).

La Jolla cn, in 517 m (? 1), 976 m (? 1 small).

Coronado cn, in 344 m (24).

Catalina cn, in 266 m (5 large), 362 m (6), 379 m (5), 914 m (5 moderately large).

### Nothria pallida Moore, 1911

Monterey cn, in 260 m (17).

Hueneme cn, in 209 m (46), 373 m (40+).

Dume cn, in 299 m (3), 374 m (14), 530 m (1).

Redondo cn, south wall, in 232 m (10), 378 m (3), north wall, 113 m (25), 148 m (12), 239 m (2), 246 m (6), 282 m (2), 298 m (2 jv), 378 m (1), slope, 310 m (6), 334 m (many).

San Pedro sea valley, dredged in 50-100 fms (43+), 459 m (2), 522 m (1).

Newport cn, in 211 m (14), 235 m (5 large), Coronado cn, in 1105 m (3).

Catalina cn, in 216 m (9).

Largest tubes are from Redondo canyon, south wall, in 378 m; they measure 450 mm long by 8 mm across.

### Nothria spp.

Hueneme cn, in 183 m (2), 338 m (1).

Mugu cn, in 119 m (4).

Redondo cn, axis, 503 m (1 fragment), slope, 556 m (1 fragment).

Newport cn, in 85 m (1 fragment).

La Jolla cn, in 79 m (1), 371 m (1).

Coronado cn, in 177 m (9 jv).

San Clemente rift valley, in 1406 m (1).

### Onuphis eremita Audouin and M. Edwards, 1833

Hueneme cn, in 383 m (1).

### Onuphis nebulosa Moore, 1911

Redondo cn, north wall, in 107 m (15).

San Pedro sea valley, dredged in 240-280 m (several), 319 m (1).

Santa Cruz cn, in 89 m (6).

Tanner cn, in 298 m (1).

### Onuphis parva Moore, 1911

Mugu cn, in 177 m (22), 367 m (1).

Dume cn, in 374 m (3), 398 m (7).

Santa Monica cn, in 268 m (1), 330 m (6), 362 m (3).

Redondo cn, south wall, in 76 m (2), north wall, 107 m (2), 120 m (9), 122 m (15), 146 m (3), axis, 148 m (1), 344 m (1), slope, 167 m (154), 310 m (6).

San Pedro sea valley, in 187 m (1).

Newport cn, in 97 m (1), 140 m (1), 170 m (1), 272 m (12).

La Jolla cn, in 121 m (9).

Coronado cn, in 123 m (4).

Catalina cn, in 88 m (3), 216 m (10), 362 m (? 7), 379 m (1).

### **Onuphis vexillaria** Moore, 1911

Hueneme cn, in 373 m (30+), 376 m (2), 397 m (6), 478 m (4 large).

Mugu cn, in 378 m (12), 507 m (2), 530 m (1).

Dume cn, in 398 m (12), 507 m (2), 530 m (1).

Santa Monica cn, in 431 m (8 large), 454 m (5 large), 463 (3 large), 583 m (1 large).

Redondo cn, north wall, in 465 m (1), axis, 137 m (1 jv), 378 m (3 jv), 431 m (2), 560 m (8 large), 611 m (3 large, measure to 150 mm long).

San Pedro sea valley, in 437 m (1 large), 459 m (1 +), 468 m (1 large).

Newport cn, in 211 m (1 fragment), 235 m (1 fragment), 478 m (1).

Coronado cn, in 812 m (1).

Tanner cn, in 1298 m (2 small).

### **Onuphis** spp.

Redondo cn, south wall, in 519 m (1 fragment), 542 m (1), axis, 282 m (1 fragment), 422 m (1 fragment), 503 m (1 fragment), slope, 334 m (1), fan, 715 m (1 jv).

Santa Cruz cn, in 89 m (248 jv).

Tanner cn, in 298 m (12 jv).

### **Rhamphobrachium longisetosum** Berkeley and Berkeley, 1938

Santa Cruz cn, in 89 m (2).

## Family EUNICIDAE

### **Eunice americana** Hartman, 1944

Hueneme cn, in 397 m (1).

Mugu cn, in 378 m (3).

Dume cn, in 398 m (1 large).

Santa Monica cn, in 116 m (1 large), 268 m (4), 330 m (3), 362 m (1).

Redondo cn, south wall, in 57 m (1), 378 m (? 1), north wall, 113 m (1), axis, 246 m (1 large), 344 m (1 jv), slope, 310 m (2 large).

San Pedro sea valley, in 221 m (1 fragment), dredged in 100-300 m (1 small), dredged in 240-280 m (1).

Newport cn, in 97 m (1).

La Jolla cn, in 79 m (1).

Coronado cn, in 123 m (1 jv), 177 m (1 jv), 344 m (1).

Santa Cruz cn, in 89 m (1).

Catalina cn, in 266 m (1 large).

### **Eunice multipectinata** Moore, 1911

Santa Monica cn, trawled in 80-200 m, rocky bottom (3 large). This species constructs parchmentlike tubes which follow rocky crevices; the tube adheres fully to the rocky surfaces.

### **Eunice** sp.

Catalina cn, in 218 m (1 fragment). Prostomial antennae are smooth; branchiae are first present from the third setigerous segment, and acicular hooks are yellow; the characteristics agree with those of *Eunice filamentosa* Grube, 1856.

### **Marphysa belli oculata** Treadwell, 1921

Fig. 2a-e

Treadwell, 1921, pp. 61-64, pl. 5, fig. 13.

San Pedro sea valley, in 221 m (1), dredged in 406 m (1), dredged in 240-280 m (2).

La Jolla cn, in 79 m (2).

Catalina cn, in 373 m (3).

The description and illustrations (Fig. 2) are based on the lot from Catalina canyon. Length does not exceed 12 mm and width 1.1 mm; this is conspicuously less than originally reported, 70 mm, for specimens from Key West Harbor, West Indies, the type locality. Branchiae are first present from the 10th setigerous segment and continue abruptly large and unipinnately divided through 12 segments; they have up to 8 filaments in single series at greatest development. Middle and posterior segments lack branchiae.

The prostomium is rounded in front (Fig. a) and has a pair of reddish circular eyes located between the bases of the outermost and mediolateral antennae. The 5 similar antennae are tapering, smooth,

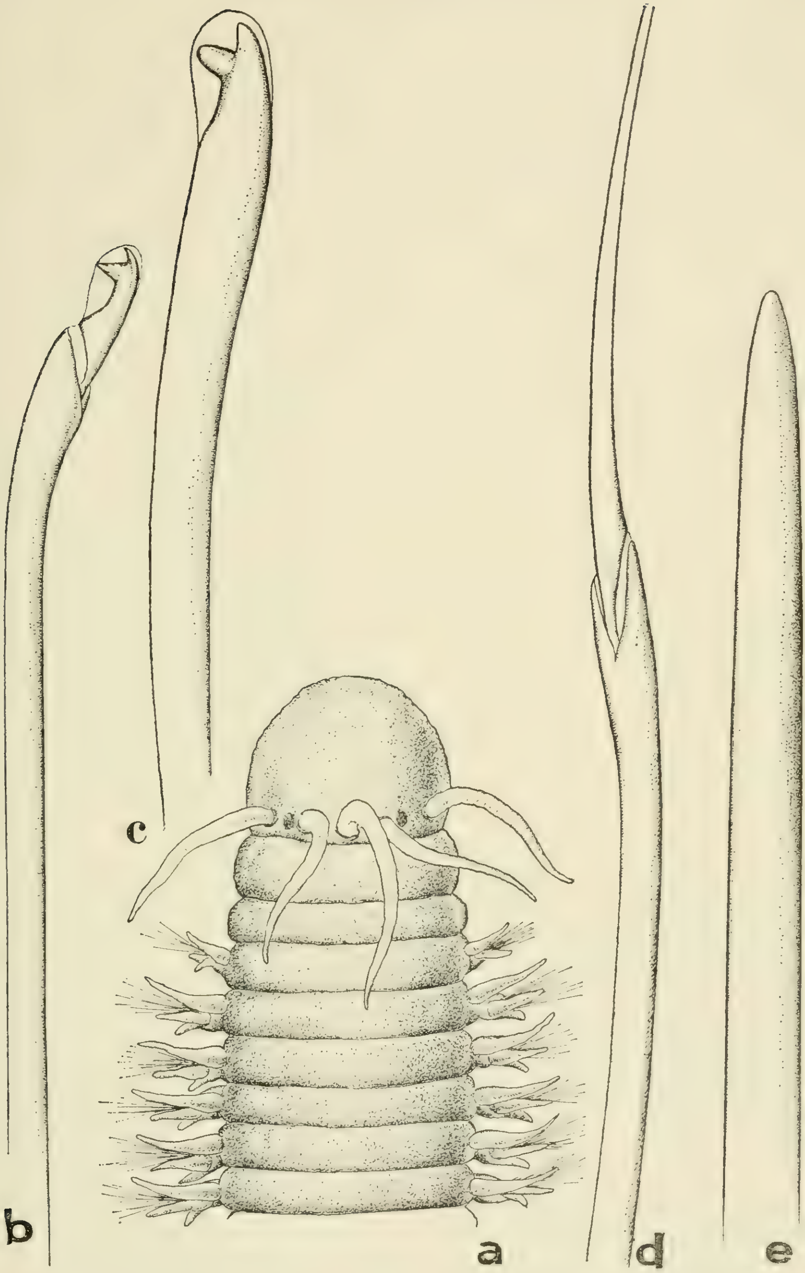



Fig. 2. *Marphysa belli oculata,* Sta. 6819-60, Catalina canyon, in 379 meters

a, anterior end in dorsal view, showing entire margin of prostomium and first 6 setigerous segments, x 31; b, composite, falcigerous, distally bifid hook; c, subacicular, distally bifid, hooded hook; d, composite spiniger; e, aciculum (all setae and aciculum to the same magnification).

longer than the prostomium and inserted in a broad crescent at the posterior margin of the head lobe.

Parapodia have 5 kinds of setae: (1) long, slender, capillary setae are present in most fascicles; (2) similarly long, somewhat thicker composite spinigers (Fig. d) occur in anterior, branchial and postbranchial segments; (3) shorter, about as thick composite falcigers (Fig. b) are present in postbranchial parapodia; (4) subacicular bifid hooded hooks (Fig. c) singly in a fascicle are first present from postbranchial segments, and (5) comb setae in postbranchial segments. In addition, thick, rodlike embedded acicula (Fig. e) are pale at the tip and dark in the embedded portion.

The mandibles are well developed, oblique at the cutting edge and slightly excavate. The maxillae have the following formula: forceps are falcate; II has 6 teeth right and 7 left; III has 7 teeth right and 6 left, IV has 5 teeth left, and none on the right side; carriers are short and narrow.

The stem species is best known as a Mediterranean and west Atlantic coastal species, where it occurs in sandy sediments in the *Zostera* zone (Fauvel, 1923, p. 410). Ehlers (1887) recorded it off southern Florida in 230 fms, and Treadwell (1921) described the subspecies from Mangrove Key in southern Florida. The present records are the first from the eastern Pacific Ocean and the sixth species of the genus from California. The specimens originate in depths of 79 to 373 meters.

### **Marphysa disjuncta** Hartman, 1960

Santa Monica cn, in 268 m (1).

Redondo cn, south wall, in 57 m (8), north wall, 113 m (4), 363 m (1), axis, 422 m (1).

San Pedro sea valley, in 221 m (7).

### **Marphysa conferta** Moore, 1911

Santa Monica cn, trawled in 80 m, rocky (1, ovigerous).

San Pedro sea valley, in 187 m (1 jv).

## Family LUMBRINERIDAE

### **Lumbrineris acuta** Verrill, 1875

Newport cn, in 37 m (2).

Santa Cruz cn, in 89 m (3).

### **Lumbrineris bassi** Hartman, 1944

Newport cn, in 272 m ( ? 5).

**Lumbrineris bicirrata** Treadwell, 1929

Hueneme cn, in 338 m (1 large), 376 m (1 large).

Santa Monica cn, 330 m (1 large).

Redondo cn, south wall, in 57 m (3 large), 76 m (8), 378 m (1), north wall, 107 m (2 large), 113 m (1), 122 m (1), axis, 137 m (1), 148 m (1), 282 m (1), 344 m (1 large), 378 m (5), 431 m (1 large), 503 m (1 small), 560 m (1).

San Pedro sea valley, in 187 m (5).

Newport cn, in 211 m (1).

La Jolla cn, in 121 m (2).

Coronado cn, in 177 m (1 fragment).

Santa Cruz cn, in 221 m (1), 319 m (1 small).

Catalina cn, in 88 m (2 large), 216 m (? 1 large), 379 m (1 large).

**Lumbrineris bifilaris** (Ehlers) 1901

Redondo cn, north wall, in 120 m (1), axis, 282 m (2).

**Lumbrineris californiensis** Hartman, 1944

Hueneme cn, in 98 m (4 small).

Mugu cn, in 15 m (2 large).

Santa Monica cn, in 431 m (? 1).

Redondo cn, north wall, in 146 m (1 fragment).

San Pedro sea valley, in 221 m (18).

Newport cn, in 97 m (1).

**Lumbrineris cruzensis** Hartman, 1944

Hueneme cn, in 177 m (1), 456 m (1 fragment).

Mugu cn, in 124 m (2).

Santa Monica cn, in 268 m (3 small), 362 m (2), 463 m (? 2 jv).

Redondo cn, south wall, in 57 m (many), 76 m (5), 232 m (73), north wall, 113 m (18), 120 m (12), 122 m (21), 363 m (1), 465 m (3), 554 m (1 fragment), axis, 137 m (12 small, ovigerous), 148 m (23, some ovigerous), 239 m (3), 282 m (2) 298 m (4), 344 m (1), 431 m (5), basin slope, 334 m (1), 652 m (? 1).

San Pedro sea valley, in 221 m (5), 522 m (2), dredged in 100-300 m (1).

Newport cn, in 37 m (18), 85 m (10), 170 m (5), 178 m (7), 211 m (8), 272 m (19), 478 m (1 fragment), 553 m (1 fragment).

La Jolla cn, in 79 m (about 30), 121 m (35), 135 m (13), 274 m (2).

Coronado cn, in 123 m (6), 177 m (17).

Santa Cruz cn, in 218 m (2), 221 m (? 3), 459 m (33).

Catalina cn, in 216 m (21 small), 266 m (19 small), 362 m (6), 379 m (14), 914 m (1).

**Lumbrineris index** Moore, 1911

Monterey cn, in 168 m (1 large and 2 small).

Dume cn, in 299 m ( ? 1), 530 m (10 large, ovigerous).

Santa Monica cn, trawled in 200 m, rocky (1 fragment), 454 m (1 large).

Redondo cn, south wall, in 232 m (6 large), axis, 137 m (5 large), 148 m (1), 239 m (6 large), 246 m (3), 282 m (2), 298 m (1 large), 378 m (5 large), 503 m (4 large, ovigerous), 560 m (17).

San Pedro sea valley, in 187 m (12 large), 221 m (2), 319 m (2 large, ovigerous), 406 m (2 large), 437 m (1), dredged in 100-300 m (1 large).

Newport cn, in 37 m (1 large), 37 m (5).

La Jolla cn, in 79 m (1 large).

Santa Cruz cn, in 459 m (3).

Catalina cn, in 216 m (1), 1272 m (1 large).

**Lumbrineris inflata** Moore, 1911

Santa Monica cn, trawled in 80 m, rocky bottom (3).

**Lumbrineris latreilli** Audouin and M. Edwards, 1834

San Pedro sea valley, dredged in 100-300 m (15 or more).

Newport cn, in 97 m (4).

Catalina cn, in 1282 m ( ? 1 fragment).

**Lumbrineris limicola** Hartman, 1944

Santa Monica cn, in 330 m (1).

Redondo cn, north wall, in 107 m (54, very small and slender), 146 m ( ? 7 jv, as in 107 m), basin slope, 310 m (5 small).

Newport cn, in 235 m ( ? 6 small).

Coronado cn, in 1105 m (1).

San Clemente rift valley, in 950 m (1), 1406 m (1).

Tanner cn, in 1298 m (5 small).

**Lumbrineris longensis** Hartman, 1960

Mugu cn, in 676 m ( ? 3 jv), 755 m (3).

Coronado cn, in 1265 m ( ? 1).

Catalina cn, in 88 m ( ? 15, very small and slender).

**Lumbrineris minima** Hartman, 1944

Newport cn, in 16 m (20 or more).

**Lumbrineris,** nr **sarsi** (Kinberg) 1865

Hueneme cn, in 177 m (3).

**Lumbrineris simplicis** Hartman, 1959

Hueneme cn, in 383 m (2 large).

**Lumbrineris tetraura** (Schmarda) 1861

Redondo cn, axis, in 282 m (? 4 small).

Newport cn, in 16 m (? 5).

They differ from typical *Lumbrineris tetraura* in having black, not pale acicula; though small they are ovigerous.

**Lumbrineris,** unknown sp.

Dume cn, in 507 m (1). This is a small, conspicuously moniliform species.

**Lumbrineris** spp.

Hueneme cn, in 98 m (2), 209 m (1), 271 m (1), 338 m (2 small).

Mugu cn, in 119 m (32), 177 m (10 jv), 573 m (1 jv), 755 m (1).

Santa Monica cn, in 116 m (3 small), 330 m (2 fragments), 475 m (1 fragment).

Redondo cn, south wall, in 57 m (some), 542 m (9), axis, 611 m (1 jv), basin slope, 167 m (1 fragment), 334 m (1), fan, 602 m (1), 660 m (3 small), 715 m (several small), 751 m (1 anterior end).

Newport cn, in 16 m (5), 140 m (1 fragment), 741 m (2 jv).

La Jolla cn, in 708 m (1 fragment, with very long setae).

Coronado cn, in 812 m (5 small, with long setae).

Santa Cruz cn, in 89 m (8 fragments).

Catalina cn, in 549 m (3 small), 559 m (2 small fragments).

Tanner cn, in 603 m (1 fragment), 644 m (1 jv).

**Ninoë gemmea** Moore, 1911

Hueneme cn, in 165 m (1), 177 m (1 fragment).

Mugu cn, in 124 m (1).

Dume cn, in 299 m (1).

Santa Monica cn, in 116 m (4), 183 m (2).

Redondo cn, south wall, in 575 m (1), north wall, 113 m (5), axis, 137 m (4), 148 m (1).

San Pedro sea valley, in 187 m (3).

Newport cn, in 85 m (2).

La Jolla cn, in 79 m (1), 121 m (3), 793 m (1), 986 m (? 12).

Coronado cn, in 812 m (15), 960 m (1), 1105 m (1).

Santa Cruz cn, in 1387 m (2, ovigerous).

Catalina cn, in 914 m (1), 1272 m (1).

This species attains its maximum numbers in La Jolla and Coronado canyons, below depths of 800 meters.

## Family ARABELLIDAE

### **Arabella iricolor** (Montagu) 1804

Newport cn, in 16 m ( ? 1 fragment).

### **Drilonereis ?longa** Webster, 1879

Redondo cn, slope, in 167 m (5), 310 m (3).

La Jolla cn, in 79 m (2 or more).

Coronado cn, in 1105 m (2).

The body is long and slender; posterior parapodia have elongated pre- and post-setal lobes.

### **Drilonereis ?nuda** Moore, 1909

Redondo cn, south wall, in 76 m (1), north wall, 107 m (2), 113 m (1), 120 m (1 fragment), 146 m (2 jv).

Newport cn, in 97 m (1).

La Jolla cn, in 79 m (5), 121 m (2).

Coronado cn, in 123 m (2 jv), 177 m (3), 812 m (1 large).

Santa Cruz cn, in 89 m (6).

Catalina cn, in 362 m (1).

In these specimens, posterior parapodial lobes are not elongated; they differ from the original account in that the mandibular apparatus is present instead of absent.

### **Drilonereis** spp.

Mugu cn, in 119 m (1).

Santa Monica cn, trawled in 200 m (1, drab green with pale prostomium), 268 m (3 jv), 330 m (2 fragments), 454 m (1 jv).

Redondo cn, slope, in 334 m (1), fan, 751 m (1).

San Diego trough, in 840 m (1), 844 m (1).

Coronado cn, in 1265 m (1).

Santa Cruz cn, in 221 m (1 jv).

Catalina cn, in 216 m (2), 914 m (1 small).

Tanner cn, in 644 m (2 jv), 813 m (1 jv).

## Family DORVILLEIDAE

**Dorvillea articulata** (Hartman) 1938

Hueneme cn, in 376 m (1).

Santa Monica cn, in 116 m (112), 183 m (38 small), 330 m (7).

Redondo cn, south wall, in 232 m (2), 378 m (14), 575 m (1), north wall, 113 m (1), axis, 137 m (57), 148 m (1), 239 m (2), 246 m (13), 298 m (1), 378 m (4), 431 m (7).

San Pedro sea valley, in 187 m (2), 221 m (3), 319 m (12), 406 m (1), dredged in 100-300 m (5).

Newport cn, in 97 m (1), 178 m (2), 272 m (1 jv).

Catalina cn, in 362 m (1 fragment).

Tanner cn, in 298 m (1).

**Dorvillea gracilis** (Hartman) 1938

Santa Monica cn, in 116 m (some).

**Dorvillea moniloceras** (Moore) 1909

Redondo cn, axis, in 282 m (3).

**Dorvillea atlantica** (McIntosh) 1885

Coronado cn, in 344 m (7). This is a long, linear species measuring 35 mm long by 1.7 mm wide. The prostomium has a pair of large eyes, located in front of the articulated antennae, and a pair of much smaller ones near the posterior margin of the lobe. The long dorsal cirrophore is penetrated by a slender aciculum. The neuropodium is distally truncate and shortest along its dorsal edge. The ventral cirrus extends beyond the setigerous lobe. Dorsalmost neuropodial setae are furcate spines accompanied by long, slender capillary setae. The composite falcigers have an appendage in which length/width proportions are in the ratio of 20 to 40.1, considerably longer than those typical of *Dorvillea atlantica,* from the Atlantic Ocean (see Fauvel, 1923, p. 449).

This is the first record of the species from the eastern Pacific Ocean.

**Dorvillea** sp.

Hueneme cn, in 478 m (1).

Catalina cn, in 216 m (1).

## ORBINIIDAE

**Califia calida** Hartman, 1957

Mugu cn, in 580 m (3), 755 m (1).

Dume cn, in 507 m (4 large), 652 m (7), 741 m (4).

Santa Monica cn, in 542 m (1), 612 m (1 large).

Redondo cn, north wall, in 554 m (1), slope, 556 m (1 large), fan, 602 m (several), 652 m (1), 660 m (3 large), 686 m (1), 706 m (? 1), 751 m (1), 786 m (1 large).

San Pedro sea valley, in 437 m (1 large), 459 m (1), 522 m (2 large), 666 m (1), 716 m (1 large).

Newport cn, in 741 m (1).

San Diego trough, in 844 m (1).

La Jolla cn, in 545 m (2 large).

Coronado cn, in 1105 m (2), 1265 m (1).

Catalina cn, in 549 m (2 large), 559 m (3 large).

**Haploscoloplos elongatus** (Johnson) 1901

Hueneme cn, in 98 m (3), 165 m (103), 177 m (32 large), 183 m (2), 209 m (4), 271 m (2 jv), 376 m (2), 455 m (1).

Mugu cn, in 119 m (13), 367 m (3), 378 m (1).

Dume cn, in 299 m (1).

Redondo cn, south wall, in 57 m (11), 378 m (1), north wall, 107 m (12 jv), 113 m (1 jv), 120 m (1 jv), 363 m (3), axis, 137 m (1), 148 m (2), 239 m (6), 246 m (1), 282 m (10), 298 m (2), 344 m (1), 378 m (8), 422 m (1), 431 m (4), 503 m (1), slope, 310 m (2).

San Pedro sea valley, in 220 m (2), 461 m (1), dredged in 100-300 m (3).

Newport cn, in 16 m (132), 97 m (1), 235 m (5), 272 m (2), 420 m (2), 478 m (3), 741 m (1 small).

San Diego trough, in 840 m (1), 686 m (1).

La Jolla cn, in 79 m (23), 135 m (3 jv), 274 m (5 jv), 371 m (3), 517 m (2), 793 m (6), 976 m (4).

Coronado cn, in 344 m (1), 812 m (3), 960 m (2 small).

Santa Cruz cn, in 902 m (8).

Catalina cn, in 216 m (4 jv), 266 m (6), 362 m (23), 379 m (38), 549 m (1), 559 m (44).

Tanner cn, in 644 m (4), 813 m (4 jv), 1298 m (1).

**Naineris uncinata** Hartman, 1957

Santa Cruz cn, in 89 m (1), 218 m (1), 221 m (4).

**Naineris** sp.

Catalina cn, in 914 m (2 very small, ovigerous).

**Phylo nudus** (Moore) 1911

Coronado cn, in 566 m (1 large).

**Phylo** sp.

Dume cn, in 530 m (1 large).

**Scoloplos acmeceps profundus** Hartman, 1960

Santa Cruz cn, in 623 m (1).

**Scoloplos armiger** (Müller) 1776

Tanner cn, in 298 m (7 small).

**Scoloplos** sp.

La Jolla cn, in 79 m (2 or more).

## Family PARAONIDAE

**Aricidea (Aedicira) ramosa** Annenkova, 1934

Santa Monica cn, in 583 m (2), 612 m (1).
Redondo cn, in 107 m (4).
Newport cn, in 741 m (3).
La Jolla cn, in 793 m (37), 976 m (30).
Catalina cn, in 1272 m (1).
Tanner cn, in 644 m (3), 603 m (4).

The prostomial antenna is dendritically branched. Branchiae number about 10 pairs. Dorsal cirri are long, very slender and threadlike, continued on segments through the postbranchial regions. Parapodia have only slender, distally pointed setae, as in the subgenus *Aedicira*. This species occurs frequently with *A. lopezi rubra*, below, from which it differs in being white instead of rust-colored.

**Aricidea (Aedicira)**, unknown species

San Diego trench, in 768 m (2).
Santa Cruz cn, in 623 m (6).

Specimens from San Diego trench measure less than 10 mm long; the body narrows abruptly behind the branchial region. Setae are all capillary, as characteristic of the subgenus. The prostomium is short and truncate in front. Its median antenna is slender and inconspicuous. Branchiae number 9 pairs; they are first present from the fourth setigerous segment and those of the second to fourth pairs are largest; thereafter they diminish in size to the last smallest pair. Large white ova are present in the body behind the branchial segments.

Specimens from Santa Cruz canyon are small, white, and measure 6 to 8 mm long and about 0.3 mm wide. The body is widest in the region of the second to fifth branchial pairs. The prostomium is bluntly depressed, conical and lacks eyes. The median antenna is slender,

digitate, shorter than the lobe and inserted near its middle. The prostomial lobe consists of 3 sections set off by a pair of diagonally oblique lines extending from the midlength at the sides to the posterior margin of the lobe.

The first postoral segment is the first setigerous one; its parapodia are biramous and provided with simple, distally pointed setae, as are all others. Branchiae are present from the fourth setigerous segment; the first pair are largest, and there is gradual decrease in size to the last, or tenth pair. Branchiae taper distally without an abruptly slender end; they are much larger than the parapodial postsetal lobes, straplike and directed upward and forward. Notopodial postsetal lobes are slender, digitate, present on all segments. Ventral cirri are slender, inconspicuous, digitate lobes, and visible on all parapodial segments.

### **Aricidea (Aricidea), nr fauveli** Hartman, 1957

Tanner cn, in 496 m (4).

These specimens differ from *Aricidea fauveli* from the Mediterranean Sea in the following respects: branchiae number 10 instead of 12 to 50 pairs; eyes are absent. They agree in that posterior neuropodial setae are acicular and have a long, slender arista inserted subdistally. Notopodial setae are entirely slender and capillary. Dorsal cirri are very long and slender. The prostomial lobe is elongate, triangular, provided with a median antenna that is long, slender and tapers distally.

### **Aricidea (Aricidea) lopezi** Berkeley and Berkeley, 1956

Hueneme cn, in 397 m (1 small).

Mugu cn, in 119 m (2).

Dume cn, in 652 m (? 3).

Santa Monica cn, in 268 m (1), 330 m (1).

Redondo cn, south wall, in 76 m (1), north wall, 107 m (3), 113 m (20), 120 m (6), 146 m (5), axis, 137 m (6), 148 m (44), 282 m (2), slope, 167 m (7), 310 m (1).

San Pedro sea valley, in 661 m (2), 666 m (2).

Newport cn, in 16 m (1), 37 m (2), 85 m (4), 235 m (6), 272 m (3), 420 m (? 1), 478 m (1).

La Jolla cn, in 79 m (310+), 274 m (1), 637 m (22 small, some ovigerous).

Santa Cruz cn, in 89 m (3), 459 m (3).

Catalina cn, in 559 m (2), 1272 m (2).

Tanner cn, in 298 m (2).

**Aricidea (Aricidea) lopezi rubra,** new subspecies

Newport cn, in 553 m (105), 642 m (17), 741 m (1).

Santa Cruz cn, in 676 m (10)

Tanner cn, in 603 m (13), 644 m (26), 1298 m (2).

In size, color and general appearance these specimens resemble *Aricidea (Cirrophorus) furcata* (see below). They agree with the stem species, *A. lopezi,* in their neuropodial modified hooks; the branchiae increase in length posteriorly and they are distally prolonged as a slender filament; they number 9 to 11 pairs and the last 2 pairs are slenderest. The red color of the body is intensest in thoracic segments; farther back it is diffuse so that it forms transverse bars across the dorsum. Neuropodia have transverse series of hooks distally capped by a pointed hood.

Some individuals are ovigerous; ova are present in most segments behind the second to fourth postbranchial segment. The subspecies differs from the stem chiefly in color, and comes from deep instead of shallow sea bottoms.

*Aricidea lopezi rubra* is associated with other deepwater paraonids, *A. ramosa* and *Paraonis gracilis,* and other polychaetes including *Melinnexis, Lysippe, Antinoella* and *Glycera capitata branchiopoda.*

**Aricidea (Aricidea)** nr **suecica** Hartman, 1957

Mugu cn, in 119 m (4).

Santa Monica cn, in 330 m (7).

Redondo cn, north wall, in 120 m (2).

Newport cn, in 16 m (1+), 97 m (1).

La Jolla cn, in 79 m (2).

Coronado cn, in 123 m (6).

Catalina cn, in 914 m (154 large).

Tanner cn, in 298 m (1).

The largest, most abundant specimens come from Catalina canyon, in 914 meters. They have long, hairlike setae in full tufts in notopodia and neuropodia and may be in swarming stage. Length is about 20 mm and width to 2 mm. The everted pharynx in some individuals is a large smooth sack. The prostomial antenna is short and club-shaped. Abdominal neuropodia have transverse series of simple acicular hooks, slightly sigmoid in the free length, in addition to slender, capillary setae.

**Aricidea (Aricidea) uschakowi** Zachs, 1925

Mugu cn, in 721 m (3), 755 m (3).

Santa Monica cn, in 463 m (2), 612 m (4).

Redondo cn, slope, in 310 m (2), fan, 652 m (3 fragments).

San Pedro sea valley, in 461 m (1 large).

Newport cn, in 16 m (17), 85 m (1), 211 m (1), 272 m (6), 420 m (? 2).

La Jolla cn, in 79 m (2), 545 m (? 1 jv), 793 m (4), 976 m (4).

Coronado cn, in 812 m (1), 1265 m (1).

Santa Cruz cn, in 89 m (3), 1387 m (1).

Catalina cn, in 88 m (2), 549 m (6 jv), 559 m (2 jv).

San Clemente cn, in 1406 m (1).

### **Aricidea** spp.

Santa Monica cn, trawled in 80 m (2), 431 m (1), 542 m (1).

Redondo cn, south wall, in 519 m (1+), 575 m (1), slope, 556 m (1), fan, 602 m (2), 810 m (many).

Newport cn, in 741 m (7).

Santa Cruz cn, in 623 m (2).

Catalina cn, in 216 m (1).

### **Aricidea (Cirrophorus) aciculata** Hartman, 1957

Mugu cn, in 177 m (1).

Redondo cn, north wall, in 107 m (6), 122 m (5), 146 m (2), slope, 167 m (6), 310 m (7), 556 m (1).

Newport cn, in 420 m (1), 478 m (1).

La Jolla cn, in 976 m (3).

### **Aricidea (Cirrophorus) furcata** Hartman, 1957

Santa Cruz cn, in 89 m (4).

### **Paraonis gracilis** (Tauber) 1879

Monterey cn, in 168 m (2), 260 m (3), 410 m (14).

Hueneme cn, in 209 m (1), 373 m (3) and (1), 397 m (6).

Mugu cn, in 119 m (1), 177 m (2), 378 m (1)

Santa Monica cn, in 268 m (3), 330 m (2), 454 m (3), 463 m (5), 542 m (1).

Redondo cn, south wall, in 76 m (1), 232 m (1), north wall, 107 m (44), 113 m (12), 120 m (25), 122 m (6), 146 m (10), 465 m (2), 554 m (1), axis, 246 m (1), 282 m (1), 298 m (2, 344 m (4), slope, 167 m (8), 310 m (9), 556 m (2).

San Pedro sea valley, in 319 m (3), 437 m (1), 461 m (1), 468 m (1), 522 m (1), 661 m (1).

Newport cn, in 16 m (12+), 85 m (12), 170 m (1), 178 m (1), 211 m (2), 235 m (13), 272 m (3), 420 m (1 jv), 478 m (57), 553 m (5), 642 m (3), 741 m (4).

La Jolla cn, in 79 m (37+), 121 m (8), 637 m (2), 793 m (6).

Coronado cn, in 177 m (4), 960 m (1).

Santa Cruz cn, in 89 m (1), 902 m (2).

Catalina cn, in 88 m (2), 216 m (4), 266 m (1), 549 m (4), 559 m (1).

Tanner cn, in 603 m (6), 644 m (5), 1298 m (1).

**Paraonis gracilis oculata** Hartman, 1957

La Jolla cn, in 976 m (77).

Coronado cn, in 812 m (2).

Catalina cn, in 914 m (2), 1272 m (4).

**Paraonis** spp.

Redondo cn, axis, in 611 m (1), fan, 602 m (3).

San Diego trench, in 734 m (1).

Santa Cruz cn, in 676 m (5).

Family APISTOBRANCHIDAE

**Apistobranchus** sp.

Redondo cn, south wall, in 76 m (1).

Family SPIONIDAE

**Laonice ?cirrata** (Sars) 1851

Mugu cn, in 119 m (5).

Redondo cn, north wall, in 107 m (4).

Newport cn, in 16 m (8).

**Laonice foliata** (Moore) 1923

Hueneme cn, in 209 m (1), 373 m (1), 376 m (1).

Redondo cn, south wall, in 54 m (1), north wall, 113 m (1), 120 m (1 large), axis, 137 m (4 large), 148 m (1 very large), 246 m (2 large), 378 m (4), 560 m (1).

San Pedro sea valley, in 221 m (1), 319 m (1 fragment).

Newport cn, in 37 m (1 and 1), 170 m (6), 178 m (1 large), 211 m (5), 235 m (6), 272 m (? 3).

La Jolla cn, in 79 m (1), 121 m (18), 517 m (1 fragment).

Coronado cn, in 177 m (4).

Santa Cruz cn, in 218 m (1).

Catalina cn, in 88 m (2), 216 m (5 large), 379 m (1).

San Clemente rift valley, in 950 m (1).

Interramal pouches are first present at segment 20 (Redondo cn, in 246 m), or not before segment 35-36, in a large specimen from Catalina canyon.

**Laonice** spp.

Redondo cn, south wall, in 57 m (1), 76 m (12 jv), 232 m (5 large), north wall, 122 m (7), 146 m (3 fragments), axis, 298 m (2), slope, 167 m (4), 334 m (1), fan, 686 m (1), 715 m (1 large) (with unusually long branchiae).

La Jolla cn, in 793 m (1 fragment).

Santa Cruz cn, in 459 m (22).

Tanner cn, in 496 m (16), 603 m (1 fragment), 644 m (2 jv), 813 m (3 anterior ends).

**Nerinides maculata** Hartman, 1961

Redondo cn, south wall, in 76 m (1), north wall, 120 m (2).

**Nerinides pigmentata** (Reish) 1959

Redondo cn, north wall, in 107 m (1).

Newport cn, in 16 m (12).

La Jolla cn, in 79 m (1).

**Polydora,** cf. **caulleryi** Mesnil, 1897

Newport cn, in 553 m (3).

Santa Cruz cn, in 623 m (2 jv).

**Polydora** spp.

Dume cn, trawled in 40-50 fms, in U-shaped burrows on rocky surfaces.

Redondo cn, south wall, in 57 m (many, in tubes fully attached to tube of *Diopatra ornata*), 542 m (10 or more), north wall, 107 m (2 jv), 554 m (1), axis, 422 m (1), slope, 556 m (1), fan, 652 m (1 fragment), 660 m (4 jv), 810 m (1).

Newport cn, in 37 m (1), 211 m (1), 553 m (3).

La Jolla cn, in 79 m (1 jv), 371 m (1).

Coronado cn, in 177 m (1 jv).

Santa Cruz cn, in 218 m (1), 459 m (2).

Tanner cn, in 496 m (7).

Some specimens from Santa Cruz canyon resemble *Polydora socialis* (Schmarda); the first parapodia are biramous; branchiae are first present from the eighth setigerous segment and well developed; hooded hooks occur from the seventh neuropodium and each hook has a large fang nearly at right angles to the main shaft.

Specimens from Tanner canyon are small, measure 10 mm long or less. The prostomium is deeply bifid at its frontal margin; it is without eyes and a median antenna. Nuchal ridges extend to the modified fifth segment. The first segment is biramous; the second

parapodia are much larger. Branchiae are first present from the eighth setiger and present on more than 20 segments. The modified fifth segment has three kinds of setae; the largest, numbering about 6 on a side, are thick and acicular; they terminate in an oblique concavity and a subterminal thick shoulder. The companion setae are much slenderer, distally pointed and subdistally expanded. A fascicle of stiff, distally pointed geniculate setae forms a lower tuft, some distance below the curved series of large hooks. Anterior neuropodia, from the seventh segment, have hooded hooks in which the main fang is larger than the subdistal tooth and nearly at right angles to the shaft. In posterior segments these hooks have a main fang obtuse to the shaft and the subdistal tooth is much smaller and shorter.

**Prionospio pinnata** Ehlers, 1901

Monterey cn, in 168 m (5), 260 m (? 1).

Hueneme cn, in 165 m (16), 177 m (14 large, measure to 85 mm long), 183 m (4), 383 m (1 small), 373 m (4), 376 m (2), 397 m (6, lack eyes and branchiae are firmly attached), 456 m (2).

Mugu cn, in 119 m (4), 177 m (15), 367 m (5).

Dume cn, in 299 m (3), 374 m (3), 398 m (4), 580 m (2 small).

Santa Monica cn, in 268 m (3), 330 m (1 small), 362 m (3 fragments), 454 m (1, lacks eyes), 542 m (1, lacks eyes).

Redondo cn, south wall, in 232 m (8), 378 m (1), 519 m (2), 575 m (2), north wall, 107 m (8), 113 m (12), 120 m (10), 130 m (5), 146 m (7), 554 m (1), axis, in 137 m (7 large), 148 m (33), 239 m (2), 246 m (4), 282 m (12), 344 m (6 large), 378 m (5), 422 m (8), 431 m (13), 503 m (22 large, measure to 150 mm long, prostomial eyes reduced or invisible, branchiae firmly attached); 560 m (13), 611 m (6 large, branchiae firmly attached), slope, 310 m (10), 334 m (several), 560 m (15), 652 m (2 small).

San Pedro sea valley, in 187 m (13), 221 m (47), 319 m (2 small), 406 m (5), 459 m (7 small), 522 m (5).

Newport cn, in 16 m (32), 37 m (28 large, and 16), 85 m (4 large), 97 m (15), 140 m (1), 170 m (6), 178 m (5), 211 m (15), 235 m (24), 272 m (15), 420 m (8, lack eyes), 553 m (2 jv).

La Jolla cn, in 79 m (7), 121 m (2), 135 m (2), 274 m (2 large), 371 m (1 large and 3 small).

Coronado cn, in 123 m (1 jv), 177 m (2), 344 m (3).

Santa Cruz cn, in 89 m (2, with 4 very small eyes).

Catalina cn, in 88 m (2), 216 m (1), 266 m (12), 362 m (5 small) 379 m (4 small), 549 m (2 fragments), 559 m (1).

Tanner cn, in 603 m (? 1), 1298 m (1 jv or small).

**Prionospio pygmaeus** Hartman, 1961

Redondo cn, north wall, in 107 m (63).

Tanner cn, in 298 m ( ? 5).

**Prionospio malmgreni** Claparède, 1870

Hueneme cn, in 165 m (5), 338 m (2 small), 456 m (1).

Mugu cn, in 119 m (34), 177 m (5).

Santa Monica cn, in 116 m (1), 268 m (1), 330 m (? 2).

Redondo cn, south wall, in 57 m (60), 76 m (12 jv), 232 m (5), 378 m (2), north wall, 113 m (8 small), 120 m (35), 122 m (9), 146 m (22), axis, 137 m (7), 148 m (26), 282 m (3), 344 m (4), slope, 167 m (10), 310 m (6).

San Pedro sea valley, in 187 m (1), 468 m (5 jv).

Newport cn, in 16 m (2), 37 m (2), 97 m (7), 211 m (3), 235 m (2), 272 m (3 jv).

La Jolla cn, in 79 m (12), 274 m (2 jv).

Coronado cn, in 177 m (1).

Santa Cruz cn, in 89 m (2).

Catalina cn, in 218 m (2 jv).

**Prionospio cirrifera** Wirén, 1883

Monterey cn, in 410 m (1).

Hueneme cn, in 177 m (26 very small, ovigerous), 183 m (3), 373 m (6).

Dume cn, in 530 m ( ? 1).

Santa Monica cn, in 268 m (1), 612 m ( ? 3 fragments).

Redondo cn, south wall, in 57 m (24), north wall, 120 m (5), 363 m ( ? 7), axis, 137 m (8), 148 m (46, ovigerous), 298 m (40), 344 m (39), 422 m (8), 503 m (4), 560 m ( ? 3 small, ovigerous), slope, in 167 m (7).

Newport cn, in 16 m (168+), 37 m (285), 85 m (12), 235 m ( ? 35).

Catalina cn, in 88 m (3).

**Prionospio,** unknown species

Redondo cn, slope, in 556 m (2).

Newport cn, in 478 m (8).

The diagnosis is based on specimens from Newport canyon. Branchiae are first present from the second setigerous segment and number 4 pairs; the first are bipinnate, the second and third pairs are broad, laterally fimbriated, and the fourth pair are much slenderer, longer and directed upward. The prostomium has 2 pairs of small

black eyespots located at the sides and about midlength of the lobe; they can be seen only in lateral view. Lateral, interramal pouches, resembling those in species of *Laonice*, are present from the first postbranchial segments, or between segments 4 and 5. A thin, foliaceous transverse fold extends across the dorsum of about 7 or 8 segments, behind the branchial region. Neuropodia have hooded hooks, first present at about segment 20 to 22. The species is unique for having *Laonice*-like interramal pouches.

### **Prionospio** spp.

Hueneme cn, in 271 m (1).
Dume cn, in 507 m (2).
Santa Monica cn, in 475 m (1 fragment).
Redondo cn, south wall, in 378 m (5 jv), north wall, 465 m (2), slope, 334 m (2).
San Pedro sea valley, in 467 m (3, this has the first branchiae pinnate and all others are cirriform).
La Jolla cn, in 121 m (4).
Coronado cn, in 124 m (6 small).
Santa Cruz cn, in 221 m (3 jv).

### **Spio punctata** Hartman, 1961

Santa Monica cn, in 268 m (3).
Newport cn, in 37 m (3 jv).
La Jolla cn, in 121 m (1).
Santa Cruz cn, in 89 m ( ? 9).

### **Spio** sp.

Newport cn, in 37 m (3 jv).

### **Spiophanes bombyx** (Claparède) 1870

Hueneme cn, in 98 m (1).
Mugu cn, in 119 m (2).
Santa Cruz cn, in 89 m (1).

### **Spiophanes fimbriata** Moore, 1923

Hueneme cn, in 376 m (about 150, with tubes).
Mugu cn, in 367 m (3).
Santa Monica cn, in 268 m (16), 362 m (1).
Redondo cn, south wall, in 232 m (2), north wall, 107 m (3), 113 m (9), axis, 137 m (8 large), 148 m (3), 239 m (1), 246 m (3), 344 m (4), 378 m (119 large), 431 m (17), 503 m (2), slope, 167 m (5), 310 m (12 jv), fan, 751 m (1, with dark, short

nuchal organs, extending back not quite to the third setigerous segment).

San Pedro sea valley, in 187 m (1), 221 m (127), 522 m (1 fragment), 716 m (3 fragments).

Newport cn, in 85 m (15 large and 4 small), 97 m (3), 140 m (3), 170 m (3), 211 m (10), 235 m (1), 272 m (10), 533 m (1).

La Jolla cn, in 79 m (14), 371 m (1).

Santa Cruz cn, in 1624 m (2).

Tanner cn, in 603 m (2).

### **Spiophanes pallidus** Hartman, 1960

Hueneme cn, in 478 m (2).

Mugu cn, in 573 m (2), 676 m (? 2 large and 6 small).

Redondo cn, axis, in 282 m ( ? 2).

San Pedro sea valley, in 461 m (1).

Newport cn, in 553 m (1).

San Diego trench, in 686-844 m (1, with long, flowing setal tuft).

Coronado cn, in 1105 m (1), 1265 m (1).

Catalina cn, in 559 m ( ? 10), 914 m (4, with interramal pouches first present from setigerous segment 4/5).

### **Spiophanes anoculata** Hartman, 1960

Redondo cn, fan, in 660 m (1).

Santa Monica cn, in 463 m (1).

Catalina cn, in 1272 m (3).

San Clemente rift valley, in 950 m (3), 1406 m (1).

### **Spiophanes missionensis** Hartman, 1941

Mugu cn, in 119 m (4), 177 m (3).

Santa Monica cn, in 330 m (2 jv).

Redondo cn, south wall, in 57 m (some), 76 m (5), 232 m (12), 378 m (3), north wall, 107 m (12), 120 m (30), 122 m (4), 146 m (33).

San Pedro sea valley, in 187 m (14).

Newport cn, in 97 m (8).

La Jolla cn, in 79 m (2), 121 m (34).

Coronado cn, in 123 m (2), 177 m (100+).

Santa Cruz cn, in 89 m ( ? 1).

### **Spiophanes** spp.

Monterey cn, in 410 m (1).

Hueneme cn, in 338 m (1), 373 m (1 fragment).

Mugu cn, in 755 m (10).
Dume cn, in 580 m (2).
Redondo cn, in 519 m (1+), north wall, 363 m (3), fan, 715 m (1), 825 m (1).
San Pedro sea valley, in 740 m (4).
Newport cn, in 178 m (4).
La Jolla cn, in 545 m (1 fragment).
Santa Cruz cn, in 623 m (1 jv).
Catalina cn, in 266 m (2 fragments).
Tanner cn, in 644 m (1 jv).

## Family MAGELONIDAE

### **Magelona californica** Hartman, 1944

Santa Cruz cn, in 89 m (2).

### **Magelona pacifica** Monro, 1933

Monterey cn, in 168 m ( ? 4).
Mugu cn, in 119 m (7 jv).
Redondo cn, slope, in 167 m ( ? 1).
Newport cn, in 97 m (4).
La Jolla cn, in 79 m (5), 121 m (1).

### **Magelona sacculata** Hartman, 1961

Mugu cn, in 119 m (21), 171 m (1).
Redondo cn, axis, in 148 m (1).

### **Magelona** sp.

Newport cn, in 16 m (22, unusually small form).

## Family DISOMIDAE

### **Disoma franciscanum** Hartman, 1947

Monterey cn, in 168 m (1), 410 m (2 large), 906 m (1).
Redondo cn, north wall, in 113 m (2), axis, 137 m (2).

### **Poecilochaetus johnsoni** Hartman, 1939

Mugu cn, in 119 m (3).
Santa Monica cn, in 268 m (1).
San Pedro sea valley, in 221 m (1), dredged in 240-280 m (2).
Newport cn, in 37 m (1), and ( ? 4), 97 m (3).
La Jolla cn, in 121 m (6).

## Family HETEROSPIONIDAE, new
Includes LONGOSOMIDAE Hartman, 1944

### **Heterospio** Ehlers, 1875
Includes *Longosoma* Hartman, 1944

### **Heterospio** sp.

San Diego trench, in 420 m (palp only)

The family LONGOSOMIDAE Hartman (1944, p. 322) is here referred to the family HETEROSPIONDAE, new, because its only genus, *Longosoma* Hartman (1944, p. 322) previously known only from southern California in shallow depths, is believed generically referrable to *Heterospio* Ehlers (1875, p. 60) known only through a single species, *H. longissima* Ehlers (1875, p. 60) dredged off western Ireland in 426 fms; it has remained unknown except through its first find in 1869. The author has recently seen specimens taken east off Bermuda, in deep water, which are generically identical with *Longosoma catalinensis* Hartman (1944, p. 322). A more complete account of the north Atlantic species will be forthcoming in a later report.

## Family CHAETOPTERIDAE

### **Phyllochaetopterus limicolus** Hartman, 1960

Dume cn, in 299 m (1 in large tube, measures 200 mm long by 6 mm wide).

Mugu cn, in 119 m (3), 177 m (1), 367 m (1 with large tube).

Redondo cn, south wall, in 76 m (1 fragment), 232 m (2 large with tubes), 378 m (1 large anterior end and tube measuring 530 mm long), 542 m (3 with tubes), north wall, 107 m (1), 120 m (3+), 122 m (1), axis, 239 m (1), 246 m (1 large tube), 282 m (1), 378 m (1 large), 503 m (large empty tube), fan, 652 m (1 fragment), 660 m (2, with large tubes), 686 m (1+), 715 m (1 large), 751 m (2 with tubes), 786 m (1), 810 m (tubes only).

San Pedro sea valley, in 221 m (1).

La Jolla cn, in 793 m (1).

Coronado cn, in 177 m (1), 812 m (tube fragment 5 mm across).

Santa Cruz cn, in 902 m (tubes only), 1387 m (1 large).

Tanner cn, in 298 m (1), 644 m (2).

### **Phyllochaetopterus prolifica** Potts, 1914

Dume cn, trawled in 80-100 m, rocky (several).

Santa Monica cn, trawled in about 80 m, rocky (many).

Santa Cruz cn, in 89 m (1).

?phyllochaetopterid, unknown

Redondo cn, in 146 m (1, with 4 to 6 large dark hooks on each side of the modified segment; tube somewhat calcified and covered with sand).

**Telepsavus costarum** Claparède, 1870

Mugu cn, in 119 m (6).

Santa Monica cn, in 116 m (1).

Redondo cn, south wall, in 57 m (1+), 76 m (3), 232 m (1), north wall, 107 m (1), 122 m (1), axis, 246 m (1, in tube 155 mm long by 1.5 mm across), 344 m (1), 378 m (3), slope, in 167 m (1).

Newport cn, in 16 m (1 jv), 97 m (2).

La Jolla cn, in 79 m (1).

Santa Cruz cn, in 89 m (2).

## Family CIRRATULIDAE

**Acrocirrus crassifilis** Moore, 1923

Redondo cn, in 542 m (15).

**Caulleriella** sp.

La Jolla cn, in 79 m (2).

**Chaetozone corona** Berkeley and Berkeley, 1941

Mugu cn, in 119 m (19).

Newport cn, in 16 m (121), 37 m (5), 97 m (1).

**Chaetozone gracilis** (Moore) 1923

Santa Monica cn, in 542 m (1).

La Jolla cn, in 708 m (2), 976 m (? 2).

Catalina cn, in 708 m (1 fragment), 853 m (1), 914 m (3).

**Chaetozone setosa** Malmgren, 1867

Redondo cn, in 120 m (? 1), 146 m (7), 556 m (9).

**Chaetozone,** nr **spinosa** Moore, 1903

Mugu cn, in 15 m (2), 119 m (2).

Coronado cn, in 812 m (? 4).

Santa Cruz cn, in 89 m (1 fragment), 221 m (? 4).

Tanner cn, in 644 m (8), 813 m (5), 1298 m (3).

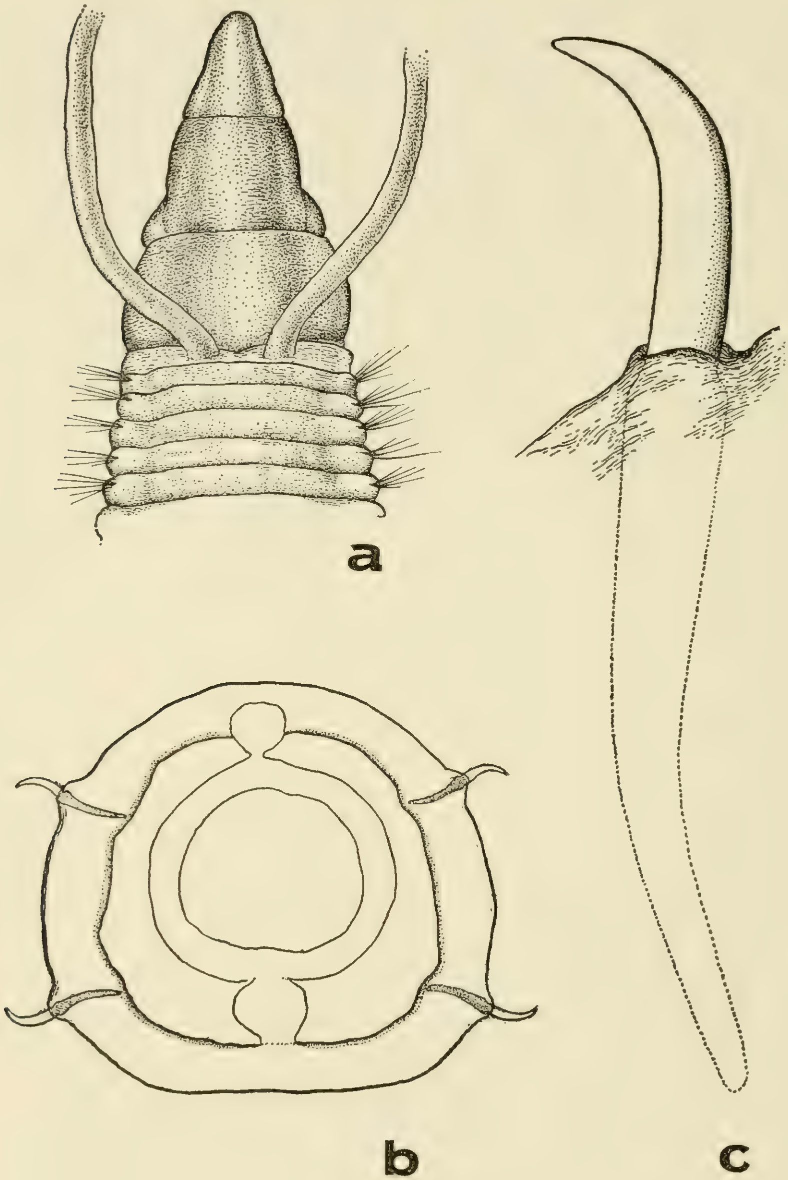



Fig. 3. *Chaetozone armata*, n. sp. (Sta. 7175-60)

a, anterior end in dorsal view, x 137.6; b, a postero-median segment in cross section, showing arrangement of parapodial setae, x 168; c, a neuropodial spine from the same segment, showing the curved tip and the embedded shoulder, x 960.

**Chaetozone armata,** new species

Fig. 3 a-c

San Pedro sea valley, dredged in 180-430 m (1, HOLOTYPE), 522 m (1).

This is a small, linear form; it measures 13.5 mm long for 72 segments (a posterior end is missing). It is widest in the anterior fourth of the body where it is about 0.68 mm across, and 0.48 mm wide in the postmedian region. The anterior region (Fig. 3a) is depressed cylindrical in cross section and its setal fascicles are directed laterally. In posterior segments the body appears moniliform because it is slenderer and the individual segments are proportionately longer; in cross section (Fig. 3b) the segments are subquadrate because the acicular spinelike setae are directed outward from the ectal margins.

The prostomium is long, triangular, about 3 times as long as wide. A pair of small black eyespots, one on either side of the raised median prostomial ridge but not visible in dorsal view; they are embedded and located near the posterior end of the lobe. The paired palpi for which the bases can be distinguished are inserted dorsally on a short segment in front of the first setigerous one.

Setal fascicles are first present behind the palpal ring. The first 16 segments have only slender, distally pointed setae that number six or more in a fascicle. Thicker, shorter yellow acicular setae are first present in segment 17, together with slender pointed setae, and within a few segments the pointed setae are almost completely replaced by single acicular spines. An occasional long, slender seta is present farther back, to segment 25 or to 36, but it is very slender and inconspicuous.

The posterior, moniliform segments are armed with single, curved spines in notopodia and neuropodia; they project obliquely upward and downward (Fig. 3b) from the setal fascicle. Seen individually (Fig. 3c) they have an entire tip and a slight shoulder in the embedded part.

*Chaetozone armata* may be distinguished from other species of the genus (Hartman, 1961, p. 104) by having moniliform posterior segments, and parapodia provided with single, acicular, distally curved spines in which the free end is curved. The type specimen originates in San Pedro sea valley (Velero IV Sta. 7175-60) in depths below 180 meters.

**Chaetozone** spp.

Monterey cn, in 260 m (1).

Redondo cn, axis, in 344 m (2 jv).

Newport cn, in 16 m (12 small), 642 m (1 fragment).

Coronado cn, in 1265 m (1).

Santa Cruz cn, in 459 m (244). Neuropodial spines are present from segment 15; notopodial spines from postmedian segments. The transverse series of spines do not nearly encircle the body. A small species, length 15 to 20 mm, has a short, thick appearance, is anteriorly dusky. The prostomium is short, blunt and directed ventrally.

Santa Cruz cn, in 902 m (2). This differs from others in that notopodia lack acicular setae.

Catalina cn, in 1272 m (1).

### **Cirratulus cirratus** (Müller) 1776

Santa Monica cn, trawled in 80 m, rocky bottom (1).

### **Cirratulus** spp.

Dume cn, in 652 m (2), 711 m (2). Both lots are pale specimens.

Santa Monica cn, in 542 m (2 jv), 583 m (2).

Redondo cn, south wall, in 542 m (1), axis, 611 m (1), fan, 652 m (5 large), 660 m (about 30).

Newport cn, in 553 m (1 jv), 741 m (1).

Catalina cn, in 549 m (1 large and 2 small).

### cirratulids, not identified

Redondo cn, south wall, in 542 m (4 large), axis, 422 m (several), slope, 334 m (1), fan, 602 m (several), 706 m (1), 715 m (several), 810 m (4).

San Clemente rift valley, in 1591 m (1, lacks lateral branchiae and has yellow acicular spines).

### **Cossura candida** Hartman, 1955

Santa Monica cn, in 330 m (1).

Redondo cn, south wall, in 57 m (4), north wall, 107 m (1 jv), 113 m (23), 120 m (1 jv), 122 m (2), 363 m (1), 554 m (1 jv), axis, 148 m (2), 239 m (1), 422 m (2), fan, 652 m (4), 660 m (3).

San Pedro sea valley, in 187 m (13), 522 m (1), 666 m (1).

Newport cn, in 16 m (182), 37 m (8), and (3), 85 m (1), 97 m (15), 170 m (3), 211 m (1), 235 m (9), 272 m (9).

San Diego trough, in all depths (some).

La Jolla cn, in 79 m (86), 121 m (15), 274 m (1), 708 m (1), 793 m ( ? 4 small), 976 m ( ? 2 small).

Coronado cn, in 123 m (1), 177 m (1).

Santa Cruz cn, in 676 m (1 jv), 1387 m (1).

Catalina cn, in 559 m (2).

Tanner cn, in 644 m (1 jv).

### Cossura pygodactylata Jones, 1956

Hueneme cn, in 165 m (1); 177 m (54 small, ovigerous).

### Cossura spp.

Hueneme cn, in 373 m (2).

Mugu cn, in 177 m (2).

Dume cn, in 711 m (2).

Santa Monica cn, in 583 m (1).

Redondo cn, axis, in 137 m (8 small).

San Pedro sea valley, in 461 m (1 fragment), 468 m (1 fragment).

### Dodecaceria sp.

Santa Monica cn, in 80 m, trawled from rocky bottom (5 small).

Santa Cruz cn, in 218 m (1 jv).

### Tharyx monilaris Hartman, 1960

Mugu cn, in 177 m (2), 755 m (1).

Santa Monica cn, in 268 m (2).

Redondo cn, south wall, in 575 m (1), north wall, 107 m (8), 113 m (2), 120 m (5), 122 m (2), 146 m (4), axis, 282 m (6), 344 m (2), slope, 167 m (2), 310 m (9).

San Pedro sea valley, in 187 m (2), 221 m (2), 319 m (2), 666 m (1).

Newport cn, in 79 m (7 or more), 121 m (6), 135 m (10), 274 m (12), 793 m (many), 986 m (12).

Coronado cn, in 123 m (5), 177 m (5), 812 m (? 2).

Santa Cruz cn, in 623 m (1 jv), 902 m (3).

Catalina cn, in 216 m (2 jv), 379 m (4, in dead *Pectinaria* tubes, filled with silt), 1272 m (2).

### Tharyx tesselata Hartman, 1960

Monterey cn, in 410 m (? 5).

Hueneme cn, in 165 m (1), 397 m (tube only).

Mugu cn, in 119 m (71), 177 m (12).

Dume cn, in 374 m (3).

Santa Monica cn, in 268 m (4), 330 m (3), 542 m (? 1).

Redondo cn, south wall, in 76 m (3), 232 m (2 jv), north wall, 107 m (10), 113 m (9), 120 m (10), 122 m (5), 146 m (4), axis, in 148 m (5), 239 m (2), 246 m (empty tube), 344 m (1), slope, 167 m (6), 310 m (18).

San Pedro sea valley, in 221 m (2).

Newport cn, in 16 m (68+), 37 m (300+), 85 m (22), 170 m (3),

178 m (8), 211 m (6), 272 m (11), 553 m (6 small), 642 m (4), 741 m (24).

**Tharyx** spp., including **T. monilaris** and **T. tesselata** (see above)

Hueneme cn, in 165 m (1, very dark).

Mugu cn, in 378 m (2 jv).

Santa Monica cn, in 116 m (several), 431 m (1).

Redondo cn, north wall, 554 m (2), axis, 137 m (1 fragment), 246 m (1 jv).

Newport cn, in 37 m (10), 97 m (10), 170 m (6).

La Jolla cn, in 79 m (2 or more), 121 m (2), 274 m (2), 371 m (? 1 jv), 545 m (1).

Coronado cn, in 123 m (6), 177 m (5).

Santa Cruz cn, in 623 m (1 jv), 902 m (3).

Catalina cn, in 216 m (2 jv).

## Family FLABELLIGERIDAE

### **Brada glabra** Hartman, 1960

Redondo cn, north wall, in 113 m (1).

Newport cn, in 420 m (1, in old *Cadulus* shell).

La Jolla cn, in 545 m (2, one in old *Cadulus,* other in old *Mitrella* shell), 708 m (4), 793 m (2), 976 m (12, in old *Cadulus* shells).

Coronado cn, in 123 m (1), 177 m (1), 566 m (2), 960 m (5).

Catalina cn, in 362 m (4, in *Cadulus* shells), 379 m (15, in *Cadulus* shells), 549 m (10, some in *Cadulus,* others in *Mitrella* shells), 559 m (2, one in *Mitrella* shell), 853 m (1).

Tanner cn, in 644 m (5).

### **Brada pilosa** Moore, 1906, perhaps the same as **Brada villosa** (Rathke), 1843

Monterey cn, in 410 m ( ? 1 fragment).

Dume cn, in 507 m (2), 530 m (1), 741 m (1).

Mugu cn, in 573 m ( ? 15), 676 m ( ? 3).

Santa Monica cn, in 454 m (1 jv), 463 m (1 jv).

Redondo cn, south wall, in 519 m (16, some ovigerous), 575 m (25, largest measure 22 mm long), north wall, 107 m (1 jv), 120 m (7), 363 m (1), 554 m (1), axis, 148 m (2), 344 m (3 small), 503 m (61), slope, 310 m (1), 556 m (36).

San Pedro sea valley, in 459 m (17, some have well extended oral tentacles; body measures 20 mm long by 3.5 mm wide), 468 m (4), 522 m (7).

Newport cn, in 16 m (7), 37 m (7 and 7), 97 m (2), 272 m (1), 478 m (7, moderately large).

San Diego trough, in 840 and 846 m (several).

La Jolla cn, in 79 m (5).

Coronado cn, in 566 m (63+), 812 m (? 1, eviscerated).

Santa Cruz cn, in 218 m (? 1), 623 m (2).

Catalina cn, in 362 m (1 fragment), 549 m (17).

San Clemente rift valley, in 1591 m (1).

Tanner cn, in 603 m (5, in dead *Cadulus* shell and *Rhodine* tube).

**Brada pluribranchiata** (Moore) 1923

Monterey cn, in 168 m (2), 410 m (4 large).

Hueneme cn, in 373 m (2), 376 m (5).

Mugu cn, in 177 m (4).

Redondo cn, south wall, in 378 m (4 large), north wall, 107 m (2 jv), 122 m (1), 146 m (2), axis, 246 m (3), 378 m (1), 431 m (1 large), slope, 310 m (1).

San Pedro sea valley, in 221 m (1), 319 m (1).

Newport cn, in 140 m (1), 170 m (4) 178 m (2), 211 m (1), 420 m (3 large).

Coronado cn, in 123 m (2).

Catalina cn, in 88 m (1), 379 m (7).

**Brada** spp.

Redondo cn, south wall, in 57 m (4), 422 m (5).

? **Diplocirrus** sp.

Redondo cn, north wall, in 146 m (2).

**Flabelligera infundibularis** Johnson, 1901

Dume cn, trawled in 80-100 m (1, in thick mucus sheath).

?**Flabelligera** sp., unknown

Santa Cruz cn, in 623 m (1 fragment).

flabelligerid, genus and species unknown

Redondo cn, in 344 m (1), axis, in 611 m (1, lemon yellow, translucent, surface of body smooth).

Tanner cn, in 644 m (6).

**Pherusa capulata** (Moore) 1909

Redondo cn, in 76 m (2 jv).

San Pedro sea valley, in 406 m (2), 100-300 m, dredged (6 large).

Newport cn, in 97 m (1).

La Jolla cn, in 79 m (2 jv), 121 m (1).

Coronado cn, in 123 m (1).

Santa Cruz cn, in 221 m (1).

**Pherusa inflata** (Treadwell) 1914

Dume cn, trawled in 80-100 m, in shaley rock (1).

Santa Monica cn, trawled in 80 m, rocks (3).

**Pherusa papillata** (Johnson) 1901

Mugu cn, in 119 m (2), 378 m (1).

Santa Monica cn, trawled in 80 m (3), and 200 m, rocky bottom (4).

Coronado cn, in 177 m (2 jv).

**Pherusa neopapillata** Hartman, 1960

Redondo cn, in 232 m (1), north wall, in 107 m (4 jv), 113 m (2), axis, 239 m (1), 298 m (2), 344 m (5), 378 m (2), slope, 556 m (2).

San Pedro sea valley, in 221 m (2), 319 m (1 jv), dredged in 100-300 m (5).

Newport cn, in 97 m (1).

La Jolla cn, in 121 m (2).

Coronado cn, in 123 m (1), 566 m (1).

**Pherusa,** nr **collarifera** (Ehlers) 1887

La Jolla cn, in 793 m (2 jv).

Santa Cruz cn, in 676 m (1 fragment).

Tanner cn, in 603 m (1), 644 m (2), 813 m (3).

**Pherusa** spp.

Mugu cn, in 352 m (1 jv).

Santa Monica cn, in 362 m (1 jv).

Redondo cn, south wall, in 57 m (18), 542 m (3), north wall, 120 m (1 jv), 363 m (1 small), 465 m (2), axis, 422 m (several), slope, 310 m (4).

San Pedro sea valley, in 461 m (2 large).

Newport cn, in 85 m (1jv).

Catalina cn, in 914 m (3 small).

## Family SCALIBREGMIDAE

**Asclerocheilus californicus,** new species

Santa Monica cn, in 695 m (1, HOLOTYPE).

Redondo cn, south wall, in 542 m (4).

San Pedro sea valley, in 661 m (1 median fragment).

This is a large, linear species and appears ragged because of the

long parapodial lobes; it measures 43 mm long by 6 mm wide, and consists of more than 70 segments. The prostomium is nearly equi-triangular, widest in front and continuous with the frontal antennae which are directed obliquely forward; there are no eyes. The first segment is a short, smooth ring without parapodia. The next two segments are longer and wider and similar to each other; each is provided with thick, acicular spines together with slender capillary setae. The spines are sigmoid in their free length and terminate distally in a smooth rounded tip.

The third segment resembles the first two but has transitional setae in which the spines are slenderer, longer and resemble the smooth, long setae of more posterior segments; in addition there are many shorter furcate spines like those in more posterior segments. Dorsal and ventral cirri are absent throughout, as characteristic of the genus. From the sixth neuropodium and the seventh notopodium a long, fleshy parapodial lobe is present, located along the suprasetal neuropodial and subsetal notopodial fascicle, and from the eighth parapodium there are four such long lobes, above and below the parapodial fascicles; they are cylindrical, fleshy and extend laterally for a distance surpassing half the setal length.

Two species have been attributed to this genus; they are *Asclerocheilus intermedius* (St. Joseph) from France and *A. beringianus* Uschakov, from Bering Sea, in 986 meters (see Hartman, 1959, p. 424). The genus was recorded from western Canada, in 10 fms, by Berkeley (1930, p. 68). These species may be distinguished as follows:

Acicular spines present in first 3 segments; body length 10-15 mm . . . . . . . . . . . . . . . . . . . . . . *intermedius*

Acicular spines present in first 2 segments; length 25 mm . . . . . . . . . . . . . . . . . . . . . . . . . . *beringianus*

Acicular spines present in first 2 segments, transitional in third segment; body length to 43 mm . . . . . . . . . *californicus*

*Asclerocheilus californicus* has been recovered only from Santa Monica and Redondo canyons, in depths of 695 and 542 meters, and San Pedro sea valley, in 661 m.

**Oncoscolex pacificus** (Moore) 1909

Santa Monica cn, trawled in 200 m, rocky bottom (1).

**Scalibregma inflatum** Rathke, 1843

Hueneme cn, in 98 m (2 jv).

Mugu cn, in 124 m (1 jv).

Redondo cn, south wall, in 57 m (5 small, ovigerous), 519 m

(1 giant, weight 900 mg), 575 m (5 mature, to 10 mm long), north wall, 107 m (16), 122 m (1 jv), 363 m (1), axis, 344 m (1), 422 m (3), 503 m (1), fan, 652 m (1 small).

Newport cn, in 140 m (1).

La Jolla cn, in 79 m (1), 121 m (3 small), 517 m (1).

Santa Cruz cn, in 89 m (1 fragment), 221 m (3 jv), 459 m (7), 623 m (1).

Catalina cn, in 362 m (1 fragment), 559 m (1 fragment).

San Clemente rift valley, in 1406 m (1).

## Family OPHELIIDAE

### **Ammotrypane aulogaster** Rathke, 1843

Mugu cn, in 177 m (1).

Redondo cn, south wall, in 57 m (1), north wall, 465 m (1).

San Pedro sea valley, in 459 m (1), dredged in 240-280 m (15).

Newport cn, in 420 m (3).

La Jolla cn, in 79 m (1), 121 m (2).

Coronado cn, in 177 m (5).

Santa Cruz cn, in 89 m ( ? 2).

Catalina cn, in 88 m (1 large), 288 m (1 large), 362 m (8 large), 379 m (5 large), 708 m (1, with 21 setigerous segments), 1272 m (1).

Tanner cn, in 496 m (6), 644 m (1), 813 m (1 fragment).

It is possible that some of these records, from deep bottoms, may refer to *Ammotrypane pallida,* below.

### **Ammotrypane pallida** Hartman, 1960

Newport cn, in 553 m ( ? 1).

San Clemente rift valley, in 950 m (1), 1406 m (2).

### **Armandia bioculata** Hartman, 1938

Redondo cn, in 57 m (1).

Tanner cn, in 298 m ( ? 4).

### **Ophelia magna** (Treadwell) 1914

Redondo cn, in 120 m (1 large, with 46 pairs of branchiae, anal hood voluminous and marginally fringed).

### **Polyophthalmus translucens** Hartman, 1960

Catalina cn, in 914 m (1).

### **Travisia pupa** Moore, 1906

Hueneme cn, in 209 m (1 large and 1 small, the larger 56 mm long and weight 8.3 grams), 373 m (1 large), 397 m (1).

Mugu cn, in 177 m (1).

Redondo cn, north wall, in 146 m (1 large), axis, 282 m (1 large, measures 70 by 22 mm), slope, 167 m (2 large, 1 small).

La Jolla cn, in 121 m (1).

Coronado cn, in 123 m (2 jv).

Catalina cn, in 88 m (2), 216 m (4 large), 362 m (2), 379 m (3 large).

**Travisia gigas** Hartman, 1938

Hueneme cn, in 177 m (1).

**Travisia** spp.

Redondo cn, south wall, in 57 m (3), north wall, 120 m (1 jv, with lateral lappets from segment 16), 122 m (1 jv), axis, 298 m (1), slope, 310 m (2).

Newport cn, in 178 m (1, measures only 10 mm long).

## Family STERNASPIDAE

**Sternaspis fossor** Stimpson, 1854

Monterey cn, in 168 m (32).

Hueneme cn, in 338 m (1).

Mugu cn, in 177 m (7).

Dume cn, in 711 m (1).

Redondo cn, north wall, in 107 m (2), 120 m (1), 122 m (1), 146 m (1).

San Pedro sea valley, in 221 m (3 large).

Newport cn, in 97 m (5), 170 m (2).

La Jolla cn, in 79 m (46), 121 m (3).

Coronado cn, in 123 m (3), 177 m (5), 344 m (2), 812 m (2).

Santa Cruz cn, in 902 m ( ? 16).

Catalina cn, in 88 m (24), 216 m (1), 914 m (3 small), 1272 m ( ? 1, sternal plates greatly reduced).

San Clemente rift valley, in 1406 m (1 small).

## Family CAPITELLIDAE

**Anotomastus gordiodes** (Moore) 1909

Mugu cn, in 119 m (3).

Newport cn, in 16 m (2).

**Barantolla americana,** new species

Monterey cn, in 260 m (8, HOLOTYPE).

La Jolla cn, in 976 m (6).

Tanner cn, in 603 m (1).

Based on the type collection from Monterey canyon (Sta. 6498-

59), length is 30 mm, width 1.2 mm and segments number more than 100. The body is smooth, linear and there are no visible branchiae. The first ring is smooth, without parapodia. The thorax consists of 12 segments of which 11 are setigerous (Hartman, 1947, p. 402); the first 6 notopodia have only setae, the next one has mixed setae and hooks and the last 4 have long handled hooks. Thoracic neuropodia have setae in the first 8 segments and hooks in the last 3 segments. The formula may be expressed as follows:

$$\text{peristomium} + \left\{ \frac{6\text{ s} + 1\text{ mixed} + 4\text{ h}}{8\text{ s} + 3\text{ h}} \right.$$

The prostomium is transversely divided into a small, globular palpode and a posterior, shorter though wider part; there are no visible eyes. The peristomium is about as long as the next segment but somewhat narrower. The everted proboscis is globular and covered with inconspicuous low papillae. The thoracic region is smooth, not reticulate and broadest in the region of the second setigerous segment. Separation between thorax and abdomen is visible as a groove, because the body is abruptly wider in the abdomen.

The only other species in the genus is *Barantolla sculpta* Southern, from Salt Lake near Calcutta, India, in brackish, shallow water. This differs from *B. americana* in having the thorax reticulated, segments with a membranous collar from which parapodial lobes originate, and branchiae present.

### **Capitella capitata** subspp.[1]

Hueneme cn, in 338 m (1), 456 m (52).

Mugu cn, in 119 m (9).

Santa Monica cn, in 116 m (more than 9200), 183 m (55).

Redondo cn, south wall, in 575 m (1), north wall, 113 m (1), axis, 137 m (1), 148 m (17), 298 m (27), 344 m (133).

Newport cn, in 85 m (2), 97 m (2), 235 m (7), 272 m (1).

La Jolla cn, in 135 m (595), 274 m (14,145), 371 m (948), 517 m (36), 545 m (1), 637 m (3), 793 m (5).

### capitellids, not identified

Catalina cn, in 1272 m (4). The thorax has 13 segments; the first ring is smooth and followed by 8 notopodia with setae and 4 with long handled hooks; thoracic neuropodia absent from the first, followed by 6 with setae and 5 with hooks.

Catalina cn, in 1272 m (2). The thorax has 14 segments; the first

[1]The subspecies and some of their records are published in Hartman, 1961, p. 333.

ring is smooth and followed by 6 segments with setae in notopodia and neuropodia, and 8 segments with long handled hooks in notopodia and neuropodia.

Redondo cn, south wall, in 57 m (1+), 542 m (2), north wall, 363 m (1 small), axis, 422 m (1), fan, 602 m (1), 715 m (1).

Coronado cn, in 566 m (19), 812 m (4).

### ?**Dasybranchus** sp.

Redondo cn, in 519 m (5).

### **Decamastus,** new genus

### Type **D. gracilis,** new species

This genus differs from *Notomastus* (see Hartman, 1947, p. 402) in having 10 instead of 11 thoracic setigerous segments. Posterior parapodia are biramous; neuropodia have reduced numbers of hooks and notopodia have few or none. It differs from *Mediomastus,* which also has 10 thoracic setigers, in having only pointed setae, instead of setae and hooks, in the thorax.

### **Decamastus gracilis,** new species

Redondo cn, south wall, in 232 m (100+, HOLOTYPE), north wall, 113 m (4).

Mugu cn, in 676 m (15+), 755 m (2).

Length of a nearly complete individual, from Sta. 2191-52, is 47 mm and width is 1.1 mm in the widest part, or between the second and fourth thoracic segments. The thorax consists of a short, triangular prostomium without eyes, a complete peristomial ring which is nearly as wide as the following segment and slightly longer, and 10 setigerous segments with only pointed setae. The abdomen is much longer and narrower, and has many more segments.

The epithelium of the peristomium and first 2 or 3 segments is slightly reticulated; it is smooth farther back. Median and posterior abdominal segments appear somewhat moniliform and collared because the parapodial ridges are constricted and have narrow, encircling flanges behind the emergence of the setae, whereas the space between successive parapodia is inflated. In cross section the thorax is cylindrical, anterior abdominal segments are trapezoidal with the longest side ventral, and posteriormost segments are again subcylindrical but slenderer than those in front.

Thoracic notopodia and neuropodia are similar to one another in having spreading fascicles of distally pointed setae, located at ectal margins and slightly behind the middle of the segment. The transition from thorax to abdomen is marked only by change from setae to long handled

hooks, and the middorsal approachment of the paired notopodia. They are somewhat elevated, nearly proximal, whereas the corresponding neuropodia are lateral, located at the widest part of the segment. Abdominal notopodial hooks in anterior and middle segments number only 4 or 5 in a transverse series, whereas their corresponding neuropodia have about 12 hooks in a series; they are disposed so that the distal fang of all notopodial hooks is directed toward the distal fang of all neuropodial ones.

In middle segments a short, collarlike flange surrounds the segments; this is located just behind the setigerous elevations. The flange enlarges at postsetal positions to form a pair of semicircular lobes, longer in dorsal and shorter in ventral parapodia. The presence of hooks in these parapodia is obscured by the lobes, but they can be distinguished in neuropodia, where they number 4 or 5 in a series; notopodia have few (2 or 3) to no hooks.

*Decamastus gracilis* has been recovered only from deep parts of longshore canyons, Redondo and Mugu, in depths of 232 to 755 meters, in muds.

**Heteromastus filobranchus** Berkeley and Berkeley, 1932

Monterey cn, in 168 m (153), 410 m (47), 750 m (2), 906 m (7).

Hueneme cn, in 98 m (4), 165 m (26), 177 m (225), 183 m (245), 209 m (45), 338 m (2), 373 m (11 and 3), 376 m (8), 478 m (9).

Dume cn, in 507 m (6).

Mugu cn, in 177 m (2), 367 m (18 large), 573 m (71), 676 m (3).

Santa Monica cn, in 475 m (1 fragment).

Redondo cn, south wall, in 378 m (16 large), 232 m (98+), 575 m (1), north wall, 113 m (1), 363 m (102), 554 m (1 fragment), axis, 148 m (24 large), 239 m (10+), 246 m (6), 298 m (54), 344 m (22), 378 m (6), 431 m (4), 503 m (28 large).

San Pedro sea valley, in 319 m (1), 406 m (14), 437 m (1).

Newport cn, in 16 m (? 4), 37 m (1), 83 m (23 large), 97 m (12), 140 m (8), 235 m (24 large), 478 m (6).

La Jolla cn, in 637 m (1 large).

**Heteromastus** sp.

Mugu cn, in 171 m (2 fragments).

Santa Monica cn, in 542 m (1 fragment).

Catalina cn, in 216 m (1 jv).

**Leiochrides hemipodus** Hartman, 1960

Dume cn, in 530 m (1), 652 m (1), 711 m (1).

Redondo cn, slope, in 556 m (5), fan, 652 m (3), 660 m (4), 706 m (1), 751 m (? 1).

San Pedro sea valley, in 459 m (3), 661 m (2), 666 m (? 7), 716 m (1).

Newport cn, in 741 m (2).

La Jolla cn, in 545 m (2), 793 m (8), 976 m (1).

Coronado cn, in 566 m (3), 1265 m (1).

Santa Cruz cn, in 902 m (25).

Catalina cn, in 549 m (4), 559 m (4).

San Clemente rift valley, in 950 m (2), 1406 m (1).

**Leiochrides** sp.

Tanner cn, in 603 m (1). This specimen differs from *Leiochrides hemipodus* (see above) in that thoracic neuropodia have setae in the first setigerous segment and the last 2 thoracic neuropodia have long handled hooks instead of pointed setae.

**Mediomastus glabrus** Hartman, 1960

Hueneme cn, in 271 m (1).

**Mediomastus californiensis** Hartman, 1944

Hueneme cn, in 177 m (18).

Mugu cn, in 119 m (1).

Redondo cn, south wall, in 76 m (2), 232 m (5), north wall, 107 m (8), 113 m (3), 120 m (7), 146 m (1 fragment), axis, 137 m (8), 148 m (4), 282 m (4), 298 m (1), 344 m (1), slope, 310 m (2).

Newport cn, in 16 m (114+), 37 m (33) (28), 85 m (12), 170 m (162), 178 m (1), 211 m (1), 235 m (7), 272 m (160+).

La Jolla cn, in 79 m (45), 121 m (4), 517 m (1 small).

Coronado cn, in 123 m (3).

**Neoheteromastus lineus** Hartman, 1960

Monterey cn, in 260 m (1).

**Notomastus hemipodus** Hartman, 1947

Newport cn, in 97 m (10).

**Notomastus ?lineatus** Claparède, 1870

Hueneme cn, in 98 m (3).

Santa Cruz cn, in 89 m (1 fragment), 218 m (3), 221 m (8).

Tanner cn, in 298 m (2).

**Notomastus magnus** Hartman, 1947

Redondo cn, in 113 m (1 large).

San Pedro sea valley, dredged in 100-300 m (2).

Newport cn, in 272 m ( ? 1 fragment).

La Jolla cn, in 79 m (2 large).

Coronado cn, in 960 m (4).

Santa Cruz cn, in 902 m ( ? 1 fragment).

**Notomastus lobatus** Hartman, 1947

Tanner cn, in 603 m ( ? 5, large) ; 644 m ( ? 7). The questionable identification refers to the fact that lobed branchiae were not observed.

**Notomastus tenuis** Moore, 1909

Mugu cn, in 378 m (1).

Santa Monica cn, in 116 m ( ? 14), 183 m (6), 268 m (2), 330 m (1), 362 m (2).

Redondo cn, north wall, in 113 m (8), axis, 282 m (1), slope, 167 m (6), 310 m (3).

San Pedro sea valley, in 187 m ( ? 17), dredged in 100-300 m (4).

Newport cn, in 178 m (4).

La Jolla cn, in 121 m (2).

Catalina cn, in 88 m (1), 379 m (3).

**Notomastus** spp.

Mugu cn, in 755 m (1).

Redondo cn, north wall, in 146 m (2 jv).

San Pedro sea valley, in 221 m (4 fragments).

Newport cn, in 37 m (2 large), 272 m (1 fragment).

La Jolla cn, in 79 m (2).

Coronado cn, in 177 m (3 jv).

Santa Cruz cn, in 459 m (3).

Catalina cn, in 559 m (2 large, anterior fragments).

Tanner cn, in 1298 m (10 fragments).

## Family MALDANIDAE

**Asychis disparidentata** (Moore) 1904

Monterey cn, in 168 m (10 large, measure to 240 mm long by 9 mm across, in a tube measuring 7 to 10 mm in diameter).

Hueneme cn, in 165 m (1), 177 m (3), 209 m (3).

Santa Monica cn, in 330 m (1 large).

Redondo cn, axis, in 246 m (1).

San Pedro sea valley, in 187 m (1 large, 80 mm long), 221 m (1), 437 m (1).

Newport cn, in 85 m (2 large), 170 m (1).

La Jolla cn, in 121 m (1 large, 126 mm long by 8 mm wide).

Catalina cn, in 266 m (1), 362 m (1 large and 1 small), 559 m (1).

**Asychis, nr gotoi** (Izuka) 1902

Coronado cn, in 1265 m (1 large, in thick tube measuring 8 mm across, animal 4 mm wide). This species is previously recorded from Japan.

**Asychis** spp.

Dume cn, in 652 m (1 large and 1 juvenile).

San Pedro sea valley, in 459 m (1 fragment, lacks anterior end).

Coronado cn, in 1265 m (1 small, anal plaque with 3 long filaments).

San Clemente rift valley, in 1406 m (1 fragment).

**Axiothella rubrocincta** (Johnson) 1901

Hueneme cn, in 183 m (2).

Mugu cn, in 177 m (18).

Newport cn, in 97 m (2).

**Axiothella** spp.

Hueneme cn, in 478 m (4).

Mugu cn, in 119 m (6, chiefly posterior ends).

Dume cn, in 374 m (1).

Santa Monica cn, in 463 m (1 fragment).

Redondo cn, south wall, in 232 m (1 fragment), north wall, 107 m (2 jv), axis, 344 m (1 jv).

San Pedro sea valley, in 221 m (1).

La Jolla cn, in 79 m (20).

Coronado cn, in 123 m (3), 177 m (2).

Santa Cruz cn, in 221 m ( ? 1).

Catalina cn, in 362 m (? 1 fragment), 379 m (1), 914 m (15, in cylindrical tubes, their basal ends loosely coiled).

**Clymenopsis cingulata** (Ehlers) 1887

Santa Cruz cn, in 623 m (3 large).

Tanner cn, in 644 m (2).

**Euclymene reticulata** Moore, 1923

Coronado cn, in 960 m (? 3, in arenaceous, thin-walled tubes).

**Euclymene** sp. or euclymenid

Redondo cn, north wall, in 363 m (1 posterior fragment), axis, 137 m (1 large and 1 small).

La Jolla cn, in 793 m (21), 976 m (6).

Santa Cruz cn, in 1387 m (? 1 fragment).

Catalina cn, in 379 m (1).

### Euclymeninae

Mugu cn, in 573 m (1).
Redondo cn, axis, in 378 m (? 1 posterior end), fan, in 602 m (2).
Newport cn, in 553 m (10 jv).
Santa Cruz cn, in 459 m (14 fragments).

### **Isocirrus longiceps** (Moore) 1923

Hueneme cn, in 456 m (? 1 fragment).
Santa Monica cn, trawled in 80 m, rocky bottom (1 fragment).
San Pedro sea valley, dredged in 100-300 m (1 fragment).
Newport cn, in 170 m (1).
La Jolla cn, in 79 m (1).

### **Lumbriclymene lineus** Hartman, 1960

Newport cn, in 553 m (? 1 fragment).
San Clemente rift valley, in 1591 m (1).
Tanner cn, in 644 m (2), 1298 m (2).

### **Lumbriclymene** sp.

San Diego trench, in 844 m (1).
Coronado cn, in 1265 m (1).

### **Maldane cristata** Treadwell, 1923

San Diego trough, in 768 m (5).

La Jolla cn, in 545 m (6), 708 m (5), 793 m (8), 976 m (13). The tube is thick walled, covered with mud and has lateral branches or vents, in alternate arrangement.

### **Maldane,** nr **sarsi** Malmgren, 1865

Monterey cn, in 168 m (1), 410 m (165).

Hueneme cn, in 373 m (2 jv), 397 m (2 jv).

Dume cn, in 374 m (3 jv), 398 m (? 3), 530 m (2) (the last two lots lack pigment).

Mugu cn, in 119 m (1), 177 m (58), 378 m (1), 573 m (1).

Santa Monica cn, in 268 m (6), 330 m (39), 362 m (43), 431 m (64), 463 m (17), 475 m (36 jv), 583 m (1).

San Pedro sea valley, dredged in 100-300 m (many), 480 m (310 large).

Redondo cn, south wall, in 232 m (14 large), north wall, 107 m (2), 113 m (10), 120 m (1 jv), 146 m (? 2 jv), 363 m (4), 465 m (? 50+), axis, 239 m (2), 246 m (1), 282 m (1), 344 m (1 jv), 611 m (1), slope, 310 m (161), 334 m (many), 556 m (4), fan, 652 m (1 large and 2 small).

San Pedro sea valley, in 187 m (1), 221 m (3), 406 m (1),

437 m (14), 459 m (2), 461 m (322 large and small), 468 m (14 jv), 522 m (1 jv), 666 m (1).

Newport cn, in 37 m (1), 140 m (1), 170 m (6), 211 m (22), 235 m (18), 420 m (1 large), 553 m (2 jv), 741 m (3).

San Diego trough, in 840 m (1).

Coronado cn, in 177 m (1 jv), 812 m (6), 960 m (4 large and 14 small), 812 m (6), 1105 m (1 small), 1265 m (1).

Catalina cn, in 216 m (6), 266 m (87), 362 m (6), 379 m (15), 549 m (3), 914 m (2 or more).

**?Maldanella robusta** Moore, 1906

Redondo cn, in 76 m (2 large).

Santa Cruz cn, in 218 m ( ? 1).

maldanids, not identified

Santa Monica cn, in 330 m (2, fragmented).

Redondo cn, axis, in 422 m (10 or more), fan, 715 m (several).

Coronado cn, in 123 m (2 jv).

Santa Cruz cn, in 623 m (5 or more, fragmented).

Tanner cn, in 813 m (4 anterior ends and tail of another one).

**Nicomache ?lumbricalis** (Fabricius) 1780

San Pedro sea valley, in 522 m ( ?1).

Tanner cn, in 603 m (1 jv).

**Nicomache personata** Johnson, 1901

Santa Monica cn, trawled in 80 and 200 m, rocky bottom (many).

San Pedro sea valley, dredged in 100-300 m (1+).

**Nicomache** spp.

Redondo cn, fan, in 652 m (1 anterior end).

Santa Cruz cn, in 218 m (1 fragment).

Catalina cn, in 853 m (3 jv), 1272 m (1 anterior end).

Tanner cn, in 603 m (1, in arenaceous, friable tube).

**Notoproctus pacificus** (Moore) 1906

Santa Monica cn, trawled in about 200 m, rocky bottom (1 fragment, nearly white, in arenaceous tube in rocky crevice).

Tanner cn, in 644 m (5).

**Petaloproctus** sp.

Redondo cn, north wall, in 465 m (2).

**Praxillella affinis pacifica** Berkeley, 1929

Hueneme cn, in 177 m (1).

Mugu cn, in 378 m (1 large, harbors commensal *Harmothoë* sp.)

Dume cn, in 398 m (3).

Santa Monica cn, in 362 m (1), 454 m (2).

Redondo cn, south wall, in 57 m (6 or more), 232 m (3), north wall, 107 m (1), 113 m (4), 122 m (1), axis, 148 m (1), slope, 167 m (1), 310 m (3), fan, 652 m (3 fragments).

San Pedro sea valley, in 187 m (3 large).

Newport cn, in 16 m (2 large), 85 m (5 large), 97 m (2), 170 m (8), 211 m (4 large), 420 m (1), 553 m (2).

**Praxillella gracilis** (Sars) 1861

Santa Monica cn, in 268 m (1), 330 m (1).

Redondo cn, north wall, in 107 m (1), 120 m (1), 122 m (2), slope, 167 m (1).

San Pedro sea valley, in 221 m (2 large, tube 220 mm long).

La Jolla cn, in 121 m (1).

Catalina cn, in 88 m (4 large), 708 m (1 fragment).

San Clemente rift valley, in 950 m (1).

Tanner cn, in 813 m (2 anterior ends).

**Praxillella** spp.

Mugu cn, in 119 m (1), 177 m (3 fragments).

Santa Monica cn, in 475 m (1 fragment).

Redondo cn, north wall, in 146 m (2 jv), 363 m (1).

San Pedro sea valley, in 468 m ( ? 1 fragment).

Newport cn, in 140 m (1), 420 m (1 large, with 5, instead of 4 preanal, asetigerous segments), 642 m ( ? 12), 741 m (1 fragment).

Coronado cn, in 812 m (10).

Catalina cn, in 266 m (1 fragment).

Tanner cn, in 813 m (1 posterior end). It has 10 long, flattened cirri in a circlet about the anal flange.

**Praxillella trifila** Hartman, 1960

Coronado cn, in 1105 m (2).

Tanner cn, in 603 m ( ? 1).

**Praxillura maculata** Moore, 1923

Catalina cn, in 914 m (15 or more).

**Rhodine bitorquata** Moore, 1923

Monterey cn, in 260 m (1 fragment).

Mugu cn, in 177 m (31).

Redondo cn, north wall, in 146 m (1 fragment).

San Pedro sea valley, in 221 m (1).
Newport cn, in 97 m (1), 178 m (2), 741 m (1 fragment).
La Jolla cn, in 79 m (1 fragment), 708 m (? 1 fragment).
Coronado cn, in 812 m (1 fragment), 916 m (8).
Santa Cruz cn, in 902 m (1), 1387 m (2).
Tanner cn, in 603 m (1), 1298 m (1).

## Family OWENIIDAE

### **Myriochele gracilis** Hartman, 1955

Hueneme cn, in 338 m (4), 373 m (? 8), 397 m (27).
Mugu cn, in 177 m (4), 378 m (2 jv).
Dume cn, in 652 m (1).
Santa Monica cn, in 330 m (2), 583 m (? 4).
Redondo cn, south wall, in 57 m (1), 232 m (2), north wall, 107 m (1), 122 m (2), 146 m (2), 465 m (1), axis, 422 m (8), 611 m (3), slope, 167 m (1), 556 m (2).
San Pedro sea valley, in 480 m (1).
San Diego trough, in 846 m (27).
La Jolla cn, in 121 m (1).
Coronado cn, in 123 m (2), 177 m (7), 566 m (1), 1265 m (1).
Santa Cruz cn, in 89 m (2), 676 m (? 6).
Catalina cn, in 88 m (5), 266 m (5), 549 m (1), 559 m (3).

### **Myriochele pygidialis** Hartman, 1960

San Diego trough, in 844 m (45).
Tanner cn, in 496 m (3).

### **Myriochele** spp.

Mugu cn, in 721 m (1).
Santa Monica cn, in 542 m (1).
Newport cn, in 478 m (1), 553 m (3).
LaJolla cn, in 545 m (1), 976 m (1).
Santa Cruz cn, in 623 m (3), 676 m (6), 902 m (2).
Catalina cn, in 1272 m (1).
Tanner cn, in 603 m (1), 644 m (2).

### **Myriowenia californiensis** Hartman, 1960

Mugu cn, in 177 m (1).
Santa Cruz cn, in 89 m (1 fragment).

**Owenia fusiformis collaris** Hartman, 1955

Hueneme cn, in 373 m (5 jv), 456 m (2 jv).
Mugu cn, in 119 m (1), 177 m (58 jv).
Redondo cn, slope, in 167 m (1 fragment).
Santa Cruz cn, in 89 m (1), 221 m (1).
Catalina cn, in 362 m (5 jv).

**Owenia** spp.

Monterey cn, in 168 m (2).
Hueneme cn, in 373 m (5 jv), 456 m (2 jv).
Santa Monica cn, in 268 m (1).
Redondo cn, north wall, in 120 m (12).
Coronado cn, in 123 m (2).

oweniid, unidentified

Newport cn, in 16 m (79).

## Family PECTINARIIDAE

**Pectinaria californiensis** Hartman, 1941

Monterey cn, in 168 m (43), 260 m (16), 397 m (10), 410 m (1).

Hueneme cn, in 165 m (65), 177 m (2), 209 m (16), 338 m (84), 373 m (200 and 123), 376 m (24), 456 (1 jv).

Dume cn, in 299 m (1), 374 m (21 large), 398 m (10), 507 m (1).

Mugu cn, in 177 m (25), 378 m (19), 573 m (1).

Santa Monica cn, in 116 m (1 fragment), 183 m (5 dead tubes), 268 m (4), 330 m (2), 362 m (1), 454 m (2 small).

Redondo cn, south wall, in 76 m (4), 232 m (28), 378 m (44 and 65 tubes), 519 m (1), north wall, 107 m (53 jv), 113 m (312), 120 m (34), 122 m (10), 146 m (68), 363 m (more than 500), 465 m (1), axis, 137 m (580 large), 148 m (96), 239 m (5), 246 m (dead tubes only), 282 m (6), 344 m (63 of which 41 are jv), 378 (195), 422 (more than 50), 431 m (136), 503 m (5 small), slope, 167 m (26), 310 m (12), 334 m (many).

San Pedro sea valley, in 187 m (14), 221 m (70), 319 m (24), 406 m (20, and many dead blackened tubes), 437 m (1), 459 m (2), 461 m (17 large), 468 m (7), dredged in 100-300 m (1), dredged in 240-280 m (few).

Newport cn, in 16 m (14 small), 37 m, sand (2), 37 m, silt (23), 85

m (315 large and small), 97 m (47), 140 m (58), 170 m (23), 178 m (32), 211 m (55), 235 m (169 large and small), 272 m (46), 420 m (36), 478 m (15).

La Jolla cn, in 121 m (5), 135 m (206 jv), 274 m (195 jv), 371 m (774 jv, measure to 4.2 mm long).

Coronado cn, in 123 m (15), 177 m (17), 344 m (3).

Santa Cruz cn, in 218 m (1).

Catalina cn, in 88 m (12), 218 m (12 small), 266 m (10), 362 m (63), 379 m (118), 559 m (3).

## Family SABELLARIIDAE

### **Sabellaria cementarium** Moore, 1906

Santa Monica cn, trawled in 80 m, rocky bottom (several).

### **Sabellaria** sp.

La Jolla cn, in 135 m (1 jv).

## Family AMPHARETIDAE

### **Amage anops** (Johnson) 1901

Hueneme cn, in 209 m (? 1).
Mugu cn, in 171 m (6).
Santa Monica cn, in 268 m (1), 330 m (1).
Redondo cn, slope, in 167 m (1).
San Pedro sea valley, in 522 m (4).
Santa Cruz cn, in 218 m (1).
Catalina cn, in 88 m (4).

### **Amage** spp.

Redondo cn, fan, in 825 m (7).
San Pedro sea valley, in 221 m (2).
La Jolla cn, in 79 m (1).
Coronado cn, in 177 m (3).

### **Ampharete arctica** Malmgren, 1866

Mugu cn, in 119 m (2).
Santa Monica cn, in 330 m (4).
Redondo cn, slope, in 167 m (? 1), 310 m (1).
Catalina cn, in 379 m (15).

**?Ampharete** spp.

Mugu cn, in 352 m (1).
Santa Monica cn, in 268 m (1).
San Pedro sea valley, in 459 m (2).
Santa Cruz cn, in 221 m ( ? 4).
San Clemente cn, in 950 m (1), 1591 m (1).
Tanner cn, in 813 m (10 large). In mud tubes adorned with siliceous sponge spicules which project out to form a spinous tube.

**Amphicteis mucronata** Moore, 1923

Santa Monica cn, in 583 m (1).
San Pedro sea valley, in 221 m ( ? 7).
Tanner cn, in 496 m (2).

**Amphicteis scaphobranchiata** Moore, 1906

Mugu cn, in 119 m (2), 177 m (3).
Santa Monica cn, in 268 m (1), 330 m (1), 454 m (1).
Redondo cn, north wall, in 554 m (1 large), axis, in 611 m (2 large), fan, 810 m (several).
La Jolla cn, in 79 m (2).
Coronado cn, in 344 m (3).
Santa Cruz cn, in 218 m (2).
Catalina cn, in 362 m (1 fragment).

**Amphisamytha bioculata** (Moore) 1906

Santa Monica cn, in 612 m ( ? 1 small, white and ovigerous).

**Amphicteis** spp.

Hueneme cn, in 373 m (1 fragment).
Redondo cn, in 542 m (1).
Newport cn, in 741 m (7).
Coronado cn, in 177 m (1 fragment).

**?Anobothrus gracilis** (Malmgren) 1866

Monterey cn, in 168 m (10 small).
Mugu cn, in 676 m (6).
Redondo cn, in 554 m (50 or more), axis, 246 m (1).
Catalina cn, in 549 m (4).

**Anobothrus,** unknown species

Tanner cn, in 813 m (about 35).
Length of ovigerous specimens is 9 mm, width in thorax or widest

part is 0.8 mm. Setae of the tenth setigerous segment are modified, as characteristic of the genus. The prostomium is broadly trilobed at its frontal margin and has a pair of conspicuous black transverse eye patches, occurring along the posterior margin of the lateral lobes. Branchiae number 4 pairs; they are subulate and attached to form an anterior row of 3 pairs with the medial pair nearly touching at the base, and a fourth pair behind, inserted between and behind the 2 innermost pairs. Each branchia is long and tapers distally. Oral tentacles are cirriform and pennate.

The setae of the tenth setigerous segment are mucronate, slightly shorter than those in front or behind. Each is a broad blade and terminates in a long, slender mucron. Other thoracic setae are simple and tapering distally. Paleae of the first segment form a conspicuous pair of spreading fascicles with about 10 on a side; they are broad bladed and taper distally to a prolonged tip. The tube is close fitting, lined with a smooth, chitinized sheath and externally covered with rounded sand and foraminiferan particles of uniform size.

These specimens differ from *Anobothrus gracilis* (see above) in having the modified setae smooth, not spinous, and the paleae mucronate, not merely tapering distally.

**Anobothrus** spp.

Coronado cn, in 566 m (more than 100), 1265 m (1).
Santa Cruz cn, in 89 m (10).
Tanner cn, in 496 m (12).

**Glyphanostomum ?pallescens** (Theel) 1878

Redondo cn, north wall, in 554 m (2). The tube is thin, smooth, cylindrical but flaccid when empty; it measures 62 mm long by 0.6 mm wide and has transverse dark and light tan bars and is externally adorned with slender siliceous sponge spicules at its distal end. The specimens are ovigerous, and measure about 14 mm long by 0.5 mm wide. Paleae are absent. Oral tentacles are smooth, filiform, numerous and all of one kind. Branchiae number 3 pairs, are inserted in a straight line; each is long, slender or cirriform. The thorax consists of 13 setigerous segments and the abdomen of about 24.

**Lysippe annectens** Moore, 1923

Redondo cn, south wall, in 76 m (2, measure only 6 mm long and are ovigerous), north wall, 120 m (1), 146 m (1 jv), 554 m (10), axis, 611 m (4), fan, 652 m (3), 751 m (59), 786 m (4 small).

San Pedro sea valley, in 522 m (33), 661 m (37), 666 m (6), 716 m (1), dredged in 100-300 m (about 15).

Newport cn, in 553 m (12).

La Jolla cn, in 793 m (3).

Santa Cruz cn, in 221 m (1), 676 m (3).

Catalina cn, in 88 m (1), 559 m (8), 1272 m (8).

Tanner cn, in 603 m (5), 644 m (12), 813 m (2), 1298 m (1).

**Lysippe** sp.

Newport cn, in 642 m (24). Thoracic setigerous segments number 17 instead of 16.

**Melinna heterodonta** Moore, 1923

Hueneme cn, in 373 m (2), 376 m (1), 397 m (1 large).

Dume cn, in 398 m (1).

Santa Monica cn, in 268 m (1), 330 m (3), 454 m (1).

Redondo cn, south wall, in 378 m (2), 363 m (2 or more), 465 m (2), axis, 246 m (1 large with tube 112 mm long and animal 50 mm long) 344 m (1 jv), 378 m (1), 431 m (5 large).

San Pedro sea valley, in 459 m (2), 522 m (1 large), 661 m (1 large).

Newport cn, in 16 m (1), 170 m (2), 272 m (2).

Coronado cn, in 344 m (36 large, in mud-walled tubes), 566 m (6, body drab green, pygidium a short white lobe), 812 m (1 large).

Catalina cn, in 288 m (2), 362 m (1), 379 m (36).

**Melinna** sp., with elongated branchiae

San Diego trench, in 734 m (1).

Coronado cn, in 123 m (1 small).

Catalina cn, in 216 m (4).

**Melinnexis moorei** Hartman, 1960

Dume cn, in 711 m (1 large, in tube 320 mm long).

Santa Monica cn, in 583 m ( ? 1 large).

Redondo cn, slope, in 556 m ( ? 5, in tubes resembling black rubber hose), fan, 706 m (1 large, in tube 500 mm long).

San Pedro sea valley, in 461 m (1), 480 m (1 large).

Newport cn, in 478 m (4 large, tubes measure 140 mm long and the contained animal about 50 mm long. Tubes are externally adorned with brown arenaceous foraminiferans and have attached snail egg cases).

Santa Cruz cn, in 218 m ( ? 1).

San Clemente rift valley, in 950 m (tubes), 1406 m (1, tube

adorned with sponge spicules attached on end), 1591 m (1), 1620 m (tubes).

Tanner cn, in 603 m (1 large and 2 very small).

**Schistocomus hiltoni** Chamberlin, 1919

Mugu cn, in 119 m (4).

**Schistocomus** sp.

Dume cn, in 299 m (empty tube which is thin, rust colored and papyraceous).

San Pedro sea valley, in 100-300 m (2).

La Jolla cn, in 793 m (3).

Santa Cruz cn, in 89 m (2, in tubes).

ampharetids, not identified

Mugu cn, in 573 m (1).

Dume cn, in 652 m (1).

Santa Monica cn, in 542 m (3 small).

Redondo cn, south wall, in 57 m (1+), 232 m (3), north wall, 107 m (4), 465 m (2), axis, 344 m (5 jv), 422 m (more than 2), 611 m (78 small, ovigerous), slope, 556 m (4 small), fan, 686 m (many small), 706 m (about 20), 715 m (many).

Newport cn, in 97 m (4 small).

Coronado cn, in 123 m (3 jv), 566 m (12 large), 812 m (5+).

Catalina cn, in 708 m (2 small), 914 m (6 small).

Clemente cn, in 1406 m (12 small).

Tanner cn, in 644 m (12 jv).

## Family TEREBELLIDAE

**Amaeana occidentalis** (Hartman) 1944

Monterey cn, in 260 m (1).

Hueneme cn, in 98 m (1).

Redondo cn, south wall, in 57 m (2), axis, 148 m (1 jv).

Newport cn, in 16 m (10), 37 m (6), 97 m (1).

La Jolla cn, in 79 m (4), 121 m (1), 274 m (1).

Coronado cn, in 123 m (1).

**Artacamella hancocki** Hartman, 1955

Redondo cn, south wall, in 76 m (10 jv), north wall, 107 m (2), slope, 167 m (2).

**Eupolymnia** sp.

Newport cn, in 85 m (5 jv).

**?Hauchiella** sp.

Redondo cn, in 542 m (1).

**Leaena caeca** Hartman, 1960

Catalina cn, in 853 m (1).

**Lanice** spp.

Hueneme cn, in 456 m (tubes).

Redondo cn, in 107 m (1 fragment), 120 m (1 fragment), 465 m (? 1).

Newport cn, in 553 m (? 1 fragment).

Santa Cruz cn, in 89 m (1), 459 m (2 or more).

Catalina cn, in 216 m (? 1 fragment).

San Clemente rift valley, in 950 m (? 1).

Tanner cn, in 496 m (1 and 5 tops of tubes).

**Pista disjuncta** Moore, 1923

Hueneme cn, in 209 m (20 or more), 373 m (many).

Dume cn, in 299 m (2), 374 m (5 large), 398 m (9).

Mugu cn, in 119 m (12), 177 m (2).

Santa Monica cn, in 268 m (1), 542 m (1 large).

Redondo cn, north wall, in 113 m (2), axis, 137 m (12 large), 378 m (1 fragment), slope, 310 m (7 large).

San Pedro sea valley, in 221 m (1), 437 m (7 large), 459 m (17).

Newport cn, in 16 m (12), 97 m (1), 140 m (7 large), 170 m (73 large), 178 m (14 large), 211 m (68), 235 m (71), 272 m (35).

La Jolla cn, in 121 m (3 large).

Coronado cn, in 123 m (1 small).

Catalina cn, in 88 m (30 large), 1282 m (1).

Tanner cn, in 1298 m (? 1 fragment).

**Pista, cf. cristata** (Müller) 1776

Redondo cn, south wall, in 57 m (many), north wall, 107 m (5), 120 m (20), 122 m (10), 146 m (2 small), slope, 167 m (31).

Newport cn, in 97 m (2).

La Jolla cn, in 79 m (2).

**Pista elongata** Moore, 1909

Dume cn, trawled in 80-100 m, rocky bottom (1).

**Pista fasciata** (Grube) 1870

San Pedro sea valley, in 459 m (? 6).

**Pista** spp.

Redondo cn, north wall, in 554 m (1), slope, 556 m (2).
San Pedro sea valley, in 716 m (1 fragment).
Tanner cn, in 1298 m (1 fragment).
Coronado cn, in 566 m (2 small).

**Polycirrus** spp.

Dume cn, trawled in 80-100 m, rocky bottom (1).
Mugu cn, in 177 m (2).
Santa Monica cn, in 362 m (3).
Redondo cn, slope, in 310 m (4).
Newport cn, in 97 m (1).
Tanner cn, in 298 m (1).

**Scionella japonica** Moore, 1903

San Clemente rift valley, in 950 m (1).

**Streblosoma crassibranchia** Treadwell, 1914

Monterey cn, in 168 m (1), 260 m (1).
Mugu cn, in 119 m (3).
Dume cn, in 299 m (1 large, empty tube).
Santa Monica cn, in 268 m (1), 475 m (1 large).
Redondo cn, axis, in 422 m (1 fragment).
Newport cn, in 97 m (1).
Santa Cruz cn, in 218 m ( ? 2).

?**Thelepus** sp.

Redondo cn, north wall, in 465 m (1).
Santa Cruz cn, in 221 m (4 fragments, host of *Lepidasthenia* sp.)

terebellids, not identified

Redondo cn, fan, in 810 m (1).
Newport cn, in 741 m (4, perhaps unknown genus and species).
Santa Cruz cn, in 623 m (1 large, host of *Lepidasthenia* sp.)
Catalina cn, in 708 m (1 posterior fragment).

## Family TRICHOBRANCHIDAE

**Terebellides stroemi** Sars, 1835, or var.

Hueneme cn, in 338 m (1 jv).
Mugu cn, in 177 m (1).
Santa Monica cn, in 268 m (3), 330 m (1), 542 m (1 jv), 612 m (1 small).
Redondo cn, south wall, in 57 m (5), 542 m (1), 575 m (1),

north wall, 107 m (10), 120 m (4), 122 m (1), 146 m (2), 554 m (2), axis, 239 m (1), slope, 167 m (2).

San Pedro sea valley, in 187 m (1), 221 m (1), 459 m (1).

Newport cn, in 170 m (1), 178 m (1), 272 m (3), 553 m (1 small).

La Jolla cn, in 121 m (2), 545 m (1), 793 m (4 or more), 976 m (1 jv).

Coronado cn, in 177 m (16).

Santa Cruz cn, in 218 m (1 small), 221 m (1), 676 m (3).

Catalina cn, in 216 m (4 small), 288 m (8), 559 m (2), 914 m (1).

San Clemente rift valley, in 1406 m (1).

Tanner cn, in 298 m (2), 603 m (16), 1298 m (1 large, ovigerous).

It is likely that the deepwater form is specifically different from the shallow one.

## Family SABELLIDAE

### **Chone gracilis** Moore, 1906

Mugu cn, in 119 m (11).

### **Chone infundibuliformis** Kröyer, 1856

Hueneme cn, in 183 m (1).

Mugu cn, in 119 m (1).

### **Chone** spp.

Santa Monica cn, in 463 m (1, lacks crown).

Redondo cn, north wall, in 120 m (2), 146 m (1 jv), 554 m (2), axis, 344 m (1 jv), 611 m (1), slope, 310 m (2), 334 m (1).

San Pedro sea valley, in 522 m (1).

Newport cn, in 235 m (1).

Coronado cn, in 123 m (1).

Santa Cruz cn, in 89 m (8).

Catalina cn, in 379 m (2 jv).

### **?Euchone** sp.

Mugu cn, in 119 m (1).

Redondo cn, slope, in 556 m (1), fan, 660 m (1).

San Pedro sea valley, in 221 m (1).

Santa Cruz cn, in 89 m ( ? 1 posterior end).

### **Hypsicomus** sp.

Dume cn, trawled in 80-100 m (1).

### **Megalomma splendida** (Moore) 1905

Redondo cn, north wall, in 122 m (2 large), slope, 167 m (2, in cartilaginous, sand-covered tubes).

**Megalomma** spp.

Redondo cn, north wall, in 107 m (1 jv).
Tanner cn, in 496 m (2), 644 m (? 1).

**Myxicola infundibulum** (Renier) 1804

San Pedro sea valley, dredged in 100-300 m (1).

**Potamethus mucronatus** (Moore) 1923

Santa Monica cn, in 583 m (? 1).
Redondo cn, fan, in 652 m (5, in tubes), 751 m (1, in cylindrical tube 95 mm long, resembling a rubber hose).

**Potamethus** sp.

Redondo cn, slope, in 167 m (?6).
Catalina cn, in 379 m (1 fragment).
Tanner cn, in 603 m (1 small, in silt covered tube).

**Pseudopotamilla** sp.

Dume cn, trawled in 80-100 m, rocky bottom (1).

sabellid, not identified

Redondo cn, south wall, in 575 m (1, radioles lack filaments), axis, 422 m (2), fan, 602 m (2), 706 m (2).
La Jolla cn, in 976 m (1 jv).
Santa Cruz cn, in 218 m (2 jv).
Catalina cn, in 559 m (1 jv).
San Clemente rift valley, in 1591 m (1), 1620 m (1).

Family SERPULIDAE

**Apomatus** sp.

Dume cn, trawled in 80-100 m (1, in white cylindrical tube, its base attached to a rock).

**Protis pacifica** Moore, 1923

Santa Monica cn, in 583 m (tubes).
Redondo cn, in 554 m (? 1, tube attached to mollusk shell).
San Pedro sea valley, in 480 m (2), 461 m (2), 666 m (1).

protulid

Redondo cn, in 542 m (1), fan, 686 m (1), 706 m (several), 715 m (1 or more).

**Vermiliopsis** spp.

Dume cn, trawled in 80-100 m, rocky bottom (1 or more, attached to rocks).

Santa Monica cn, trawled in 80 m, rocky bottom (1 or more).

spirorbids

La Jolla cn, in 371 m (1), 637 m (100 or more, on algal strands).

Polychaete, unknown

Coronado cn, in 812 m (1). A very long, slender, threadlike specimen has parapodia consisting of a small orbicular lobe and setae consisting of single acicular spines and a few limbate setae in each fascicle. It is associated with a deepwater fauna.

Additional notes on SOLENOGASTERS

These wormlike mollusks have been most frequent in depths below 200 meters, in offshore canyons. Fifteen species in three genera are named by Schwabl (1963, in press). Most numerous are species of *Crystallophrisson*, followed by *Prochaetoderma* and *Limifossor*.

**Limifossor fratula** Heath, 1911

Schwabl, 1963, in press

Redondo cn, 310 m (4), 344 m (1), 422 m (9), 459 m (1), 602 m (2), 652 m (2), 810 m (1).

San Pedro sea valley, 459 m (1).

**Crystallophrisson hartmani** Schwabl, 1963, in press

Redondo cn, 310 m (2), 422 m (1), 459 m (1), 575 m (3), 602 m (1), 652 m (1).

**Crystallophrisson riedli** Schwabl, 1963, in press

Redondo cn, 575 m (2).

**Crystallophrisson rubrum** Schwabl, 1963, in press

Redondo cn, 575 m (1).

**Crystallophrisson scabrum** Heath, 1911

Redondo cn, 422 m (3), 465 m (2).

**Crystallophrisson** spp.

Monterey cn, 211 m (7).

Dume cn, 299 m (1), 374 m (1), 398 m (1), 507 m (1), 530 m (9), 580 m (6).

San Pedro sea valley, 50-150 fms (2), 461 m (7).

Redondo cn, 378 m (1), 422 m (2), 437 m (1), 503 m (6), 560 m (1).

Newport cn, 170 m (1), 211 m (4), 272 m (1), 420 m (5), 478 m (2), 553 m (1), 642 m (3).

La Jolla cn, 793 m (12).

Coronado cn, 566 m (8).

**Prochaetoderma californicum** Schwabl, 1963, in press

Dume cn, 374 m (5), 580 m (6).

Newport cn, 170 m (3), 178 m (2), 478 m (1), 553 m (10).

Coronado cn, 566 m (36).

Catalina cn, 379 m (6).

Additional Notes on PELECYPODS.

**Dacrydium pacificum** Dall, 1916

Fig. 4a-c.

Soot-Ryen, 1955, p. 86 (review of the genus).

Newport cn, 553 m (1).

San Diego trough, 343 m (1), 381 m (1), 420 m (1).

San Clemente rift valley, 1620 m ( ? 5).

All specimens are dead valves, but some fresh as though not long dead. Specific identity has been verified by Dr. Myra Keen, Stanford University and Dr. Harald Rehder, United States National Museum. Its occurrence from the type locality, Bering Sea in 1401 fms, is of some interest since it suggests affinities of the deepwater fauna of southern California with that of Arctic seas.

**Lyonsiella alaskana** Dall, 1894

Fig. 4d.

(Some of the collections were identified by Dr. Myra Keen).

Newport cn, 553 m (1).

Coronado cn, 566 m (3).

Catalina cn, 379 m (1).

This species was first described from the Gulf of Alaska, in 1569 fms, in green ooze. Its present distribution is limited to the deeper parts of submarine canyons. The valves are characteristic (Fig. 4d), cordate in shape, thin and delicate, and externally sculptured with radiating ridges.

**Saxicavella pacifica** Dall, 1916

This species is given special notice because it occurs in peak numbers at some places.

Monterey cn, 211 m (6).

Hueneme cn, 177 m (99), 373 m (9), 376 m (12).

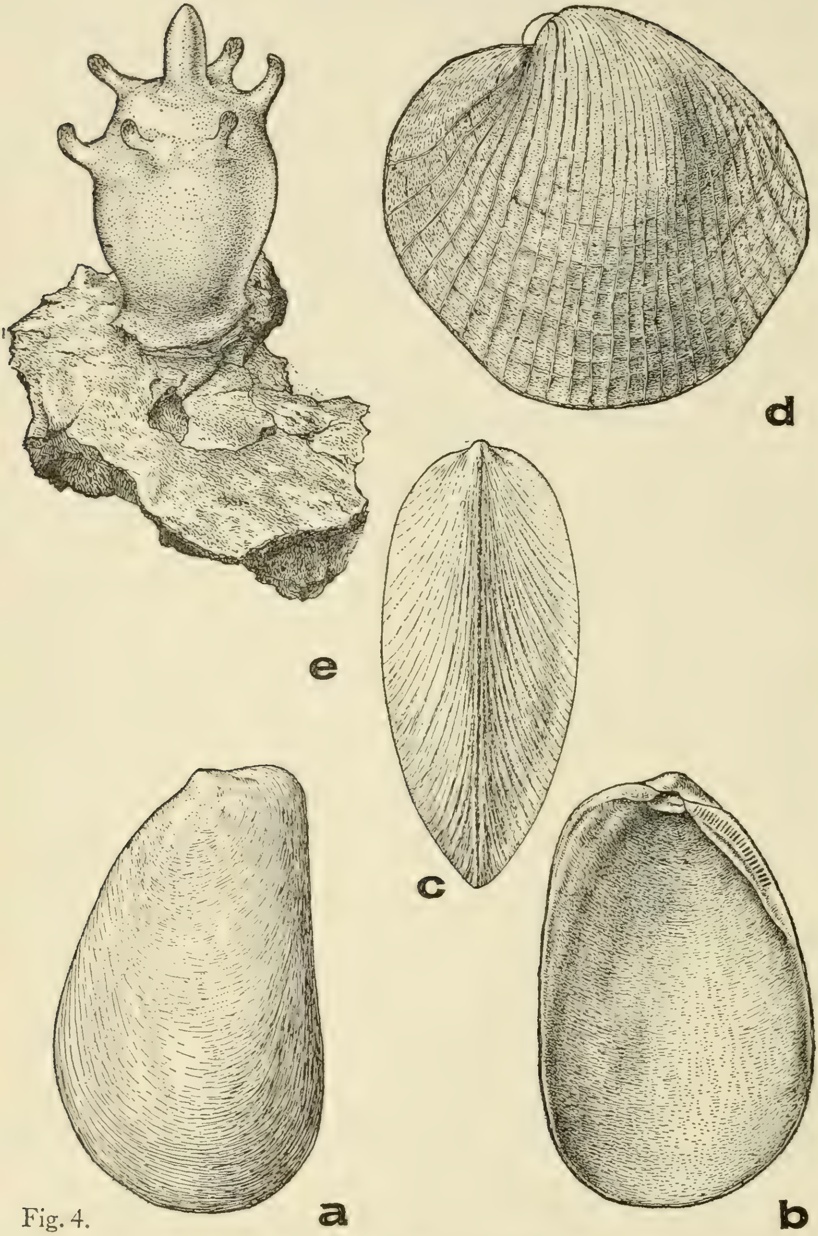



Fig. 4.

a, *Dacrydium pacificum* Dall, Sta. 6820, San Diego trough, shell in outer, left lateral view, x 11; b, same, shell seen from within, x 13; c, connected valves seen in posterior edge, x 13; d, *Lyonsiella alaskana* Dall, Sta. 6852, Coronado canyon, shell in exterior view, x 11; e, Gastropod egg capsule attached to a rock, Sta. 6805, Santa Cruz canyon, x 0.92.

San Pedro sea valley, 319 m (21).

Newport cn, 272 m (7), 420 m (10), 478 m (17).

**Amygdalum pallidulum** (Dall) 1916

Redondo cn, 76 m (240).

La Jolla cn, 545 m (8).

This nest-building mytilid was redescribed by Soot-Ryen (1955, p. 69).

**Yoldia scissurata** Dall, 1898

Redondo cn, 148 m (27).

Newport cn, 170 m (2 large), 211 m (2) measure 30 by 14 mm.

**Solemya panamensis** Dall, 1908

Santa Monica cn, 116 m (21 large).

Its occurrence in polluted areas is of some interest, since it thrives where few other mollusks are found.

**Macoma incongrua** (Martens) 1865

The greatest concentration of this deepwater pelecypod occurred in Redondo cn, 148 m (323).

**Acila castrensis** (Hinds) 1843

Hueneme cn, 177 m (4).

Mugu cn, 177 m (68).

Newport cn, 170 m (26), 211 m (110, measure about 11.5 mm long; some are penetrated by a drill).

## Additional Notes on GASTROPODS.

**Mitrella permodesta** (Dall), 1890

Redondo cn, 611 m (30).

Newport cn, 553 m (27), 642 m (49).

La Jolla cn, 545 m (1), 637 m (10 or more).

## Additional Notes on SCAPHOPODS.

**Dentalium rectius** Carpenter, 1864

Monterey cn, 168 m (5); 260 m (present); 410 m (16 living and many dead shells).

Hueneme cn, 209 m (47), 478 m (5).

Mugu cn, 177 m (37).

Redondo cn, axis, 246 m (32).

San Pedro sea valley, 817 m (150 tubes of which some are dead).

Newport cn, 85 m (1), 97 m (3), 140 m (8), 170 m (34), 178 m (50 or more, some large to 20-30 mm long), 272 m (1 large), 420 m (1).

Gastropod egg case.

Fig. 4e

Santa Cruz cn, in 218 m (3 cases), 221 m (1 case).

Several large opaque white or cream-colored egg cases were taken in two samples, both in Santa Cruz canyon. Each is broadly flask shaped, with a maximum diameter of 21 mm, and 20 mm wide at the base. The largest one measures 40 mm high to the base of the tubules and 23 mm across at its widest part. The flask is slightly constricted near the base, flares distally and gives rise to a larger distal tube and 6 to 13 smaller, slenderer tubules around the distal periphery. The capsule is thick, somewhat chitinized and tough to tear. None of the contents revealed developing young, and since the tubules were entirely opened at their distal ends, it is assumed that the young had escaped before the capsules were taken.

## ECHIUROIDEA

Three or more kinds of echiuroids were taken, only one in abundance. They are summarized here with their occurrences in the canyons. All references may be consulted in Fisher (1949, pp. 479-497).

**Arhynchite californicus** Fisher, 1949

Fisher, 1949, pp. 486-487, pl. 30.

as *Arhynchite* sp., in the List of stations and APPENDIX

Monterey cn, in 260 m (3 large) ; 410 m (4 large).

Hueneme cn, in 373 m (1 and 2 large), 376 m (2).

Dume cn, in 711 m (2).

Santa Monica cn, in 268 m (3 large), 330 m (2), 31 m (1 large), 463 m (1 small).

Redondo cn, in 146 m (2 large), 363 m (2 large), 465 m (2 large), 298 m (4 large).

The largest, from Redondo canyon, measure 140 mm long by 20 mm wide, and are dark blood red in life. The surface is opaque, papillated most intensely at anterior and posterior ends and the middle region of the body obscurely papillated. A single pair of brassy yellow, spinous, distally hooked setae is visible at the anterior ventral end of the body. The proboscis, frequently detached or lost, is long, slender, ribbonlike, distally expanded and pale or white in life. On dissection a

pair of long nephridia can be seen. The anal vesicles are very long. The fecal pellets in the alimentary tract are cylindrical, capsule-shaped, measure (in largest individuals) about 1.72 mm long and 0.64 mm across; when extruded these pellets are slightly annular.

Specimens from Redondo canyon, and perhaps also other canyons, harbor a commensal crab.

The species was first named from Monterey Bay, California, in 222 fms, in soft gray mud. The present specimens are from 146 to 711 meters, southern California.

### Echiuroid, not identified

Coll.—Newport cn, in 555 m (2), 478 m (tongue of a large one).

La Jolla cn, in 637 m (5).

Catalina cn, in 362 m (1 large), 379 m (1 large).

These individuals differ from *Arhynchite californicus* (above) in having the surface epithelium distinctly papillate throughout and the epithelium is thinner, somewhat translucent.

### Listriolobus pelodes Fisher, 1946

Coll.—Hueneme cn, in 177 m (75), 183 m (3).

Redondo cn, in 107 m (1 large).

This species is most concentrated in shelflands along the Santa Barbara-Ventura shelf (Barnard and Hartman, 1959, p. 6). The present specimens come from the upper ends of northern canyons. In life specimens are pale or grayish green and somewhat translucent.

## BRACHIOPODA

### Glottidia albida (Hinds) 1844

Mugu cn, 119 m (41).

Santa Monica cn, in 463 m (2 jv).

Redondo cn, 57 m (7), 741 m (2).

Newport cn, 16 m (1 small), 85 m (1 small), 97 m (2), 170 m (1 small).

This is typically a shelf species, in sandy bottoms; its occurrence in canyons is occasional.

## OLIGOCHAETA

Hueneme cn, in 397 m (5).

Mugu cn, in 573 m (12).

Redondo cn, axis, in 560 m (7).

Coronado cn, in 960 m (2).

The surface epithelium is minutely prickly.

## LITERATURE CITED


BARNARD, J. L., AND OLGA HARTMAN

1959. The sea bottom off Santa Barbara, California: Biomass and community structure. Pac. Nat., 1(6): 1-16, 7 figs.

BERKELEY, EDITH

1930. Polychaetous annelids from the Nanaimo district. Part 5. Ammocharidae to Myzostomidae. Can. Biol. Bd., Contrib. Canad. Biol., 6(5): 65-77, 8 figs.

EHLERS, E.

1875. Beiträge zur Kenntniss der Verticalverbreitung der Borstenwürmer im Meere. Zeits. wiss. Zool., 25:1-102, pls. I-IV.

1887. Report on the annelids. Reports on the results of dredging . . . in the U. S. coast survey steamer "Blake." Harvard. Mus. Comp. Zool., Mem., 15:1-335, pls. 1-60.

FAUVEL, P.

1923. Polychètes errantes. Faune de France. 5:1-488, figs. 1-188.

FISHER, W. K.

1949. Additions to the echiuroid fauna of the north Pacific Ocean. U. S. Natl. Mus., Proc., 99:479-497, pls. 28-34.

HARTMAN, OLGA

1947. Capitellidae. Allan Hancock Pac. Expeds., 10:391-482, pls. 43-58.

1959. Catalogue of the Polychaetous Annelids of the world. Allan Hancock Found. Pubs., Occas. Pap., 23:1-628.

1960. The benthic fauna of the deep basins off southern California. Allan Hancock Pac. Expeds., 22:69-216, 19 pls.

1961. A new monstrillid Copepod parasitic in capitellid Polychaetes in southern California. Zool. Anz., 167:325-334, 1 plate, 1 chart.

1961. Polychaetous annelids from California. Allan Hancock Pac. Expeds., 25:1-226, front., 34 pls.

LÜTZEN, J.

1961. Sur une nouvelle espèce de polychète *Sphaerodoridium commensalis,* n. gen., n. spec. (Polychaeta Errantia, famille des Sphaerodoridae) vivant en commensal de *Terebellides stroemi* Sars. Cahiers de Biol. Mar., 2:409-416, 1 fig.

McINTOSH, W. C.

1879. On the Annelida obtained during the cruise of H. M. S. 'Valorous' to Davis Strait in 1875. Linn. Soc. Lon., Trans., n. s., 1:499-511, pl. 65.

SCHWABL, M.

1963. Solenogaster mollusks from southern California. Pac. Sci. (in press), 2 charts, 7 pls., 13 figs.

SOOT-RYEN, T.

1955. A report on the family Mytilidae (Pelecypoda). Allan Hancock Pac. Expeds., 20:1-176, 10 plates, 78 text-figs.

TREADWELL, A. L.

1921. Leodicidae of the West Indian region. Carnegie Inst. Wash., Dept. Mar. Biol., 15:1-131, 467 figs., 9 pls. (Also *its* Pub. 293).

USCHAKOV, P. V.

1955. Mnogoshchetinkovye chervi dal'nevostochnykh moreĭ SSSR (Polychaeta). Akad. Nauk SSSR, Opred. po faune SSSR, 56:1-445, figs. 1-164.

# INDEX

Page numbers of plates are in **boldface** type

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 27 PART 4

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## PART IV

## SYSTEMATICS: ISOPODA

BY

GEORGE A. SCHULTZ

DEPARTMENT OF ZOOLOGY

DUKE UNIVERSITY

DURHAM, NORTH CAROLINA



UNIVERSITY OF SOUTHERN CALIFORNIA PRESS

LOS ANGELES, CALIFORNIA

1966

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 27 PART 4

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## PART IV

## SYSTEMATICS: ISOPODA

BY

GEORGE A. SCHULTZ

DEPARTMENT OF ZOOLOGY

DUKE UNIVERSITY

DURHAM, NORTH CAROLINA

UNIVERSITY OF SOUTHERN CALIFORNIA PRESS

LOS ANGELES, CALIFORNIA

1966

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## PART IV

## SYSTEMATICS
## ISOPODA, *by* GEORGE A. SCHULTZ

Allan Hancock Pacific Expeditions
Volume 27
Part IV

Issued: August 10, 1966

Price: $1.75

University of Southern California Press
Los Angeles, California

## CONTENTS

# MARINE ISOPODS OF THE SUBMARINE CANYONS OF THE SOUTHERN CALIFORNIAN CONTINENTAL SHELF

by George A. Schultz

## INTRODUCTION

The geographical, physical and biological aspects of the submarine canyons of the continental shelf off the coast of southern California have been described in earlier parts of this volume. Isopods were collected in 10 of the 15 canyons. Many benthic species were obtained since the specimens were obtained with a Campbell grab bottom sampler operated from the Hancock Foundation research vessel Velero IV. The method of collecting subjected some specimens to fragmentation, resulting in loss of legs and other damage. However all individuals could easily be placed in existing genera or differentiated from the existing genera or species, and they were all placed in their appropriate taxonomic categories. Twenty-five species in eighteen genera, of which fifteen species and two genera are new to science, were identified. Of the ten known species, six have been reported only from California, one is known from Alaska to southern California, and only three can be considered cosmopolitan.

Table 1 lists in systematic order the species identified from all of the canyons; Table 2 lists the species by canyon. The systematic arrangement used is that of Menzies (1962 a, b).

In the ten canyons sampled, an average of five species per canyon was found. Many species were common to several canyons—*Haliophasma geminata* to five, *Ilyarachna acarina* and *Gnathia crenulatifrons* to four, and other species to three or fewer. The three named species have been called "common mud bottom" species by Menzies and Barnard (1959). Tanner and Santa Cruz canyons yielded nine species each; most of those from Santa Cruz had been described, but seven of the nine species from Tanner were new to science. The other canyons yielded fewer species, and San Clemente Canyon yielded only one. No isopods were found in Dume, Hueneme, Monterey, Mugu Canyons or the San Diego trough. Some of the species described here, plus addi-

tional species from non-canyon stations, were described by Schultz (1964).

The research for this paper was made possible by a Teacher's Research Participation Fellowship grant by the National Science Foundation to the Biology Department of the University of Southern California, under the direction of Dr. Walter Martin. Dr. Robert J. Menzies directed the research, which was done in the Allan Hancock Foundation at the University of Southern California. The author wishes to thank Dr. Martin, Dr. Menzies, Dr. Olga Hartman, in whose laboratory the work was done, and the Allan Hancock Foundation.

Table 1

Canyon Isopoda

ASELLOTA

Paraselloidea

*Acanthomunna tannerensis*, new species
*Desmosoma symmetrica*, new species
*Eurycope californiensis*, new species
*Ilyarachna acarina* Menzies and Barnard (1959)
*Ilyarachna profunda*, new species
*Jaeropsis concava*, new species
*Jaeropsis dubia paucispinis* Menzies (1951)
*Janiralata solasteri* (Hatch, 1947)
*Munna spinifrons* Menzies and Barnard (1959)
*Nannonisconus latipleonus*, new genus, new species
*Pleurogonium californiense* Menzies (1951)

FLABELLIFERA

Anthuridea

*Bathura luna*, new genus, new species
*Haliophasma geminata* Menzies and Barnard (1959)

Cirolanoidea

*Aega lecontii* (Dana, 1854)
*Cirolana californiensis*, new species
*Cirolana joanneae*, new species
*Eurydice branchuropus* Menzies and Barnard (1959)
*Rocinela belliceps* (Stimpson, 1864)

GNATHIOIDEA

*Gnathia crenulatifrons* Monod (1926)
*Gnathia clementensis*, new species
*Gnathia coronadoensis*, new species
*Gnathia hirsuta*, new species
*Gnathia trilobata*, new species

VALVIFERA

*Microarcturus tannerensis*, new species
*Synidotea calcarea*, new species

Table 2

Isopod Species Listed by Canyon

The species, the station number and the depth at which the sample was taken are listed below. The type localities of the new species are indicated by an asterisk.

Coronado Canyon (6 species)

*Bathura luna*, n. gen., n. sp., 6851, 812 m.

*Cirolana californiensis,* n. sp., 6851*, 812 m.

*Gnathia coronadoensis*, n. sp., 6849, 344 m; 6851*, 812 m.

*Gnathia trilobata*, n. sp., 6851*, 812 m.

*Haliophasma geminata*, 6845, 177 m; 6846, 123 m.

*Ilyarachna acarina,* 6845, 177 m.

La Jolla Canyon (5 species)

*Bathura luna*, n. gen., n. sp., 7047, 783 m.

*Eurydice branchuropus*, 7038, 121 m.

*Gnathia trilobata*, 7049, 976 m.

*Haliophasma geminata*, 7038, 121 m.

*Ilyarachna profunda*, n. sp., 7047*, 793 m; 7049, 976 m.

Newport Canyon (3 species)

*Eurycope californiensis*, n. sp., 7032*, 478 m.

*Gnathia crenulatifrons*, 7054, 178 m.

*Haliophasma geminata*, 7052, 420 m.

Redondo Canyon (5 species)

*Gnathia crenulatifrons*, 2361, 310 m; 2789, 167 m.

*Haliophasma geminata*, 2361, 310 m; 2725, 107 m; 2727, 122 m; 2789, 167 m; 2793, 465 m; 3385, 120 m.

*Ilyarachna acarina*, 2725, 107 m; 2727, 122 m; 2793, 465 m; 3385, 120 m.

*Nannonisconus latipleonus*, n. gen., n. sp., 2793*, 465 m.

*Pleurogonium californiense*, 3385, 120 m.

San Clemente Canyon (1 species)

*Gnathia clementensis*, n. sp., 6840*, 1620 m.

San Pedro Canyon (4 species)

*Gnathia crenulatifrons*, 7174, 221 m.

*Haliophasma geminata*, 7174, 221 m; 7175, 200-472 m (dredge).

*Ilyarachna acarina*, 7174, 221 m.

*Ilyarachna profunda*, n. sp., 5639, 461 m.



Santa Catalina Canyon (2 species)

*Ilyarachna profunda*, n. sp., 6820, 559 m.

*Gnathia crenulatifrons*, 6823, 88 m.

Santa Cruz Canyon (9 species)

*Aega lecontii*, 6805, 218 m.

*Cirolana joanneae*, n. sp., 6805, 218 m; 6806*, 218 m.

*Gnathia hirsuta*, n. sp., 6805*, 218 m.

*Haliophasma geminata*, 6805, 218 m; 6806, 218 m.

*Ilyarachna acarina*, 6805, 218 m; 6806, 218 m.

*Jaeropsis concava*, n. sp., 6806*, 218 m.

*Janiralata solasteri*, 6805, 218 m; 6806, 218 m.

*Munna spinifrons*, 6805, 218 m; 6806, 218 m.

*Rocinela belliceps*, 6806, 218 m.

Santa Monica Canyon (4 species)

*Gnathia crenulatifrons*, 3000, 268 m; 3180, 330 m.

*Haliophasma geminata*, 2999, 454 m; 3000, 268 m; 3179, 362 m.

*Ilyarachna acarina*, 2999, 454 m.

*Jaeropsis dubia paucispinis*, 6781, 116 m.

Tanner Canyon (9 species)

*Acanthomunna tannerensis*, n. sp., 6833*, 813 m.

*Bathura luna*, n. gen., n. sp., 6832*, 1298 m.

*Cirolana californiensis*, n. sp., 6833, 813 m.

*Desmosoma symmetrica*, n. sp., 6836*, 469 m.

*Gnathia crenulatifrons*, 6832, 1298 m.

*Haliophasma geminata*, 6835, 298 m.

*Ilyarachna profunda*, n. sp., 6832, 1298 m.

*Microarcturus tannerensis*, n. sp., 6832*, 1298 m.

*Synidotea calcarea*, n. sp., 6833*, 813 m.

## ASELLOTA
## PARASELLOIDEA
## MUNNIDAE

### Acanthomunna Beddard

### Acanthomunna tannerensis, n. sp.

(Plate 1)

*Diagnosis:* Body (except cephalon) covered with large spines which appear to be jointed but are not. Body without pigment; two and one-half times as wide as head at widest point. Pleotelson at widest point about two-thirds as wide as body, becoming abruptly narrow, ending in slightly convex, arched margin with two posterolateral short spines. Cephalon abruptly narrower than peraeon and with large non-stalked eyes. All coxal plates visible in dorsal view except seventh, which is under the upwardly bent pleotelson. Narrow stem connecting peraeon and pleon. Peraeopods two to seven at least one and one-half times as long as body and covered with many spines. Peraeopod one shorter than body with many stout setae; modified for grasping. Dactylus of all peraeopods with one large claw each. Antenna one shorter than body, ending in seven articles of very nearly equal length. Second antenna about twice length of body with about 40 flagellar articles. Maxilliped with long palp and three coupling hooks on endite. Mandible with toothed incisor and setal row of sensory setae; palp with three segments ending in several long setae. Uropod very large with basal segment about as long as width of pleotelson and with exopod and endopod about as long as basal segment. (The type species figured was beginning to molt the anterior part of its body).

*Measurements:* Holotype female 3.5 mm long.

*Type locality:* 6833 (3); Tanner Canyon; 813 m; Jan. 29, 1960; green mud and sand. Lat. 32° 37′ 54″N, Long. 118° 58′ 40″W.

*Distribution:* Known only from type locality.

*Affinities: Acanthomunna tannerensis* is very much like *A. hystrix* (Hansen, 1916) except that it has fewer articles on its first antenna and a different setal pattern.

### Munna Krøyer

### Munna spinifrons Menzies and Barnard

*Munna spinifrons* Menzies and Barnard, 1959, pp. 13, 14, fig 7.

*Materials examined:* 6805(3); 6806(2).

*Distribution:* About 220 m in Santa Cruz Canyon near the region described by Menzies and Barnard (1959).

## DESMOSOMIDAE

The definition of this family by Menzies (1962b) should be modified slightly to include species in which the last three peraeonal segments have coxal plates visible in the dorsal view.

### Desmosoma G. O. Sars

### Desmosoma symmetrica, n. sp.

(Plate 2)

*Diagnosis:* Eyeless, pigmentless. Antennal bases deeply set into the cephalon. Anterior edge of cephalon very slightly convex. Third peraeonal segment widest, general body outline gradually tapering towards anterior and posterior ends. Coxal plates visible and acutely pointed on anterolateral edges of first four peraeonal segments. Coxal plates visible on posterolateral edges of last three peraeonal segments. Peraeonal segment five about as long as wide. Pleotelson of single segment with large posterolateral teeth; posterior edge obtusely pointed. Peraeopods, except first, furnished with plumose setae. First peraeopod with stout setae; not modified for swimming; and with one large carpal seta extending half length of propodus. Antenna one with three flagellar articles; antenna two with 12 or 13 articles. Maxilliped with three coupling hooks; triarticulate palp with last segment small and tipped with setae; molar process replaced by tuft of setae. Uropods biramous; exopod very small, endopod with plumose setae.

*Measurement:* Holotype female with marsupium 3.2 mm long.

*Type locality:* 6836(1); Tanner Canyon; 469 m; Jan. 29, 1960; green mud with shale fragments. Lat. 32° 36′ 00″N, Long. 119° 05′ 18″W.

*Distribution:* Known only from type locality.

*Affinities:* The new species is similar to *Desmosoma gracilipes* Hansen (1916), but differs from it in that the coxal plates of peraeonal segments five to seven are visible and the uropods are biramous. It is also similar to *D. tenuimana* Sars (1899), but *D. tenuimana* lacks posterolateral spines on the pleon and does not have the coxal plates visible on peraeonal segments five to seven.

## EURYCOPIDAE

### **Eurycope californiensis**, n. sp.

(Plate 3)

*Diagnosis:* General body configuration oval-oblong with all peraeonal segments distinct. Frontal area of cephalon with acutely rounded medial projection. Pleotelson of one segment; longer than wide, with posterior angle obtusely rounded. Anterolateral edges of first four peraeonal segments acutely pointed and segments of about same size. Next three peraeonal segments with less acute points; seventh segment longest and largest. Antennae missing, but base of first antenna flattened with two spines which project forward. Maxillipedal palp very reduced in size; endite with four coupling hooks. Molar process of mandible with many teeth; incisor with only three teeth; last segment of palp with many setae; second segment of palp with row of spines. Uropods missing.

*Measurements:* Holotype female 3.5 mm long.

*Type locality:* 7032(2); Newport Canyon; 478 m; May 5, 1960; green mud and gray sand, some very coarse sand. Lat. 33° 31′ 28″N, Long. 117° 54′ 58″W.

*Materials examined:* 7032(2). Two females.

*Distribution*: Known only from the type locality.

*Affinities:* The species is similar to *Eurycope magalura* Sars (1899) but *E. magalura* has a maxillipedal palp of normal dimensions, whereas the maxillipedal palp of *E. californiensis* is greatly reduced in size. The frontal projection of the cephalon is notched in *E. magalura,* but not in the new species.

## ILYARACHNIDAE

### **Ilyarachna** G. O. Sars

### **Ilyarachna acarina** Menzies and Barnard

*Ilyarachna acarina* Menzies and Barnard, 1959, pp. 9, 10, fig. 2.

*Ilyarachna acarina* Schultz, 1964, p. 310.

*Materials examined:* 2725(2); 2727(1); 2793(2); 2999(2); 3385 (19); 6805(2); 6806(3); 6845(2); 7174(10).

*Remarks:* The species was taken within the depth and distribution extremes listed by Menzies and Barnard (1959).

### Ilyarachna profunda, n. sp.

(Plate 4)

*Diagnosis:* Eyeless, pigmentless. No buccal mass visible from dorsal view. Cephalon longer than and about as wide as first peraeonal segment. First peraeonal segment narrowest of all. Inconspicuous spines on anterior edges of first four peraeonal segments. Small setae on lateral margins of four anterior segments and also on anterolateral margin of pleotelson. Peraeopods probably in general like those of co-generic species, but only first ambulatory pair present on specimens examined. Propodus and distal half of long carpus of first peraeopod with few short spines. Proximal half of carpus, merus and basis with large spines. First antenna with flagellum of approximately 28 articles; second antenna missing on specimens examined. Several plumose setae on first antenna. Maxilliped with four coupling hooks on endite; palp with five segments and large spines. Mandible with triarticulate palp; incisor with few teeth; and molar process with at least four large spines. Second male pleopod with large copulatory organ with long recurved intrusive process. Uropods missing.

*Measurements:* Holotype male 3.0 mm long. Lengths of females to 3.8 mm.

*Type locality:* 7047(1); La Jolla Canyon; 793 m; May 7, 1960; green silty mud with sand. Lat. 32° 54′ 21″N, Long. 117° 29′ 53″W.

*Materials examined:* 5639(2); 6820(1); 6832(1); 7047(1); 7949 (1).

*Distribution:* The species is found in the more southern canyons and was taken between 461 and 1298 m.

*Affinities:* The general appearance of the new species is much like that of *Ilyarachna clypeata* (Sars, 1899). Both species have a multiarticulate first antennal flagellum of approximately 28 articles. It could also be confused with *I. acarina* Menzies and Barnard (1959), but lacks conspicuous spines on the anterior edges of the peraeonal segments. The male sexual appendage is long and recurved in the new species, and is short and thick in *I. acarina.*

## JAEROPSIDAE

### Jaeropsis Koehler

### Jaeropsis concava, n. sp.

(Plate 5)

*Diagnosis:* Lateral body outline concave, segment five narrowest. Pigmentless except for small eyes of approximately seven ocelli. Small

dactylus on peraeopod one with several small spines; large setal spine on merus. First antenna with six segments; few scales on outer margin of first segment. Lateral margin of pleotelson with spines and setae. Maxillipedal palp of five segments; endite with few sensory spines on upper edge. Mandible with handlike toothed incisor; long molar process. Palp triarticulate, proximal segment with at least three setae; middle with at least six and distal segment with comblike row of setae. At least 10 sensory setae in setal row. Uropods with two minute appendages. Base of uropod with medially pointing recurved hook.

*Measurements:* Holotype male 3.1 mm long.

*Type locality:* 6806(2); Santa Cruz Canyon; 221 m; Dec. 22, 1959; rocks and coarse green sand. Lat. 33° 56′ 06″N, Long. 118° 52′ 17″W.

*Distribution:* Known only from the type locality.

*Affinities:* Close to *Jaeropsis dubia paucispinis* Menzies (1951) but longer, thinner and completely without pigment. The eyes are much smaller, and there are six rather than five segments on the first antenna. The number of spines and setae along the edge of the pleotelson is less than in *J. dubia. J. dubia* rarely was found below 90 m.

### **Jaeropsis dubia paucispinis** Menzies

*Jaeropsis dubia paucispinis* Menzies, 1951, p. 155, fig. 30, a, e.

*Jaeropsis dubia paucispinis* Menzies and Barnard, 1959, p. 11.

*Materials examined:* 6781(1).

*Distribution:* Santa Monica Canyon at 116 m within the depth and distribution extremes previously described by Menzies and Barnard (1959).

## JANIRIDAE

### **Janiralata** Menzies

### **Janiralata solasteri** (Hatch)

*Janira solasteri* Hatch, 1947, p. 172, figs. 158-160.

*Janiralata solasteri* Menzies, 1951, pp. 132-135, figs. 23, e, f, 24.

*Janirilata* [*sic*] *solasteri* Menzies and Barnard, 1959, p. 11, fig. 5.

*Materials examined:* 6805(5); 6806(2).

*Distribution:* About 220 m in Santa Cruz Canyon. The species has been found previously from Alaska to Southern California.

## NANNONISCIDAE

### Nannonisconus, n. g.

*Diagnosis:* Nannoniscidae with last peraeonal segment fused to pleon. Pleon of single somite and at widest point wider than cephalon or peraeon. Lateral outline of body concave. First antenna extending only slightly anterior of cephalon, with bulbous organ attached to apical article. The male first pleopods are different from all other Nannoniscidae in that they are not apically pointed and the proximal part is much narrower than the medial or distal part. Uropods biramous. *Nannonisconus* is very much like *Nannoniscus* G. O. Sars, but the last two peraeonal segments are fused in *Nannoniscus*, whereas the last peraeonal segment and the pleotelson are fused in *Nannonisconus*. The new genus also has a much broader pleotelson. The type species is *N. latipleonus.*

### Nannonisconus latipleonus, n. sp.

(Plate 6)

*Diagnosis*: Eyeless, pigmentless. Cephalon large with large antennal bases. Anterior edge of cephalon with concave margin. Body outline concave, narrowest part anterior part of longest peraeonal segment five. Peraeonal segment one widest peraeonal segment. Posterior third of pleotelson equals widest part of body. Margin of posterolateral edge of pleotelson with large tooth; posterior margin with large bilobed extension. All peraeopods similar to first. Antenna one with bulbous apical segment and many plumose setae. Second antenna missing. Male first pleopodal opercular lamella with enlarged posterior edge with many marginal setae. Male second pleopod with large copulatory organ with short posterior intrusive part. Maxillipedal endite with three coupling hooks. Mandibular palp with three segments. Mandible with tuft of setae replacing molar process. Uropods biramous; exopod shorter than endopod, both with plumose setae.

*Measurements:* Holotype male 2.8 mm long.

*Type locality:* 2793(1); Redondo Canyon; 465 m; May 22, 1954; blue-gray mud and large rocks. Lat. 33° 48′ 00″N, Long. 118° 32′ 00″W.

*Distribution:* Known only from the type locality.

*Affinities:* The species differs from other Nannoniscidae in that there are spines on each of the anterolateral margins of the first four peraeonal segments. The most striking difference is that the pleotelson is proportionately wider. The coxal plates of segments five to seven show in the dorsal view.

## PLEUROGONIIDAE

### **Pleurogonium** G. O. Sars

### **Pleurogonium californiense** Menzies

*Pleurogonium californiense* Menzies, 1951, pp. 139-143, figs. 25, 26.

*Pleurogonium californiense* Menzies and Barnard, 1959, pp. 14, 15, fig. 8.

*Materials examined:* 3385(3).

*Distribution:* Found in Redondo Canyon at 120 m in fine sandy mud not far from where it was reported by Menzies and Barnard (1959).

## FLABELLIFERA

## ANTHURIDEA

## ANTHURIDAE

### **Bathura**, n. g.

*Diagnosis:* Eyeless. Dorsal pits and paired statocysts present. Peraeopod one subchelate, enlarged palm with proximal low curved tooth with many lateral setae. Hand of peraeopod four forming strait joint with propodus; carpus slightly underlying propodus on peraeopods five to seven. Carpus about one-half length of propodus on peraeopods four to seven. Peraeopods four to seven laterally compressed. Pleonal segments distinct. Endopod of uropod longer than telson. Telson with pair of statocysts, pointed and with marginal row of several apical setae. Two ridges on telson with medial groove continuous with medial groove of pleonal segment six. Lateral edges of pleonal segments visible in dorsal view. Both first and second antennae with few flagellar articles. *Bathura* is most like *Ananthura*, K. H. Barnard (1925), from which it differs in general pattern of peraeopodal hand with a tooth on palm, and characteristic pattern of setae on apex of telson and uropodal rami, without any conspicuous serrulations on outer margins on endopod. The type species is *B. luna*.

### **Bathura luna**, n. sp.

(Plate 7)

*Diagnosis:* Eyeless, without pigment; peraeon smooth but with dorsal pits on segments four to seven with two lateral pits on seven. Medial rostral projection not extending as far forward as anterolateral projection. First peraeonal segment about two-thirds as long as fifth;

seventh segment shorter than first. Pleonal segments distinct; lateral edges visible in dorsal view, especially last few. Peraeopods one and two somewhat chelate, but not three to seven. Segment five of peraeopod seven about half as long as segment six. Nine flagellar articles on second antennae; five on first. Maxilliped with palp of five (four free) segments. Mandible with palp of three segments, apical one with large spine and comb of setae and second one with at least one large seta. Telson with pair of statocysts and two ridges running about one-half proximal length with medial groove between ridges continuous with groove of sixth pleonal segment. Uropodal endopod longer than telson; tips of both exopod and endopod with tuft of many long stiff setae originating from apex of margins.

*Measurements:* Holotype female with marsupium 21 mm long.

*Type locality:* 6832; Tanner Canyon; 1298 m; Jan. 29, 1960; green mud. Lat. 32° 33′ 36″N, Long. 118° 55′ 40″W.

*Materials examined:* 6832(10); 6851(1); 7047(1).

*Distribution:* The species was caught in the most southern canyons, at 783 m in La Jolla Canyon and at 812 m in Coronado Canyon, in addition to the type locality.

*Affinities:* See generic description.

## Haliophasma Haswell

### Haliophasma geminata Menzies and Barnard

*Haliophasma geminata* Menzies and Banard, 1959, pp. 17-19, figs. 11, 12.

*Haliophasma geminata* Schultz, 1964, p. 312.

*Materials examined:* 2361(2); 2725(7); 2727(2); 2789(4); 2793 (1); 2999(1); 3000(2); 3179(1); 3385(5); 6805(1); 6806(1); 6835(1); 6845(2); 6846(2); 7038(1); 7052(1); 7174(12); 7175 (1).

*Distribution:* The species was taken within the depth ranges previously recorded, but further south (Coronado Canyon) than previously recorded.

*Remarks:* The mouth parts are chewing, not piercing and sucking as recorded in Menzies and Barnard (1959, p. 17).

## CIROLANOIDEA

## CIROLANIDAE

## AEGINAE

### Aega Leach

### Aega lecontii (Dana)

*Aegacylla lecontii* Dana, 1854, p. 177.

*Aega lecontii* Richardson, 1905, pp. 176, 177; figs. 158, 159.

*Materials examined:* 6805 (1); Large female, 13 mm long.

*Distribution:* The species was previously taken in Monterey Bay, California, and is here reported from near that locality, Santa Cruz Canyon, at 218 m.

### Eurydice Leach

### Eurydice branchuropus Menzies and Barnard

*Eurydice branchuropus* Menzies and Barnard, 1959, p. 32, figs. 26, 27.

*Materials examined:* 7038 (1).

*Remarks:* The specimen was taken in La Jolla Canyon at 121 m, which is the deepest and furthest north that the species has been taken. Examination of this and other specimens, including the type in the Allan Hancock collection, reveals that the uropods are truncate, not rounded. This is different from what is stated by Menzies and Barnard (1959, p. 32).

### Rocinela Leach

### Rocinela belliceps (Stimpson)

*Aega belliceps* Stimpson, 1864, p. 155-56.

*Rocinela belliceps* Hatch, 1947, pp. 209, 210, figs. 66-69.

*Materials examined:* 6806 (3). Three female specimens, two ovigerous. Largest 12 mm long.

*Remarks:* The specimens were taken as parasites on fish. The species was previously taken from off San Diego and at Cortes Bank (off southern California) to Alaska (Richardson, 1905; Hatch, 1947).

## CIROLANINAE

### Cirolana Leach

### Cirolana californiensis, n. sp.

(Plate 8)

*Diagnosis:* Eyeless, body without pigment. Cephalon set into the first peraeonal segment. General body outline oblong-oval, becoming

narrower after the seventh peraeonal segment. Coxal plates present on segments two to seven (only four to seven visible in dorsal view). Coxal plates more acutely pointed and extended farther backward in the more posterior segments. The coxal plate extensions of segment seven enclose first pleonal segment within their lengths. Five pleonal segments distinct with lateral edges of first four visible. Lateral edges of pleonal segment five enclosed under largest pleonal segment four. Lateral extensions of pleonal segments not recurved. Telson pointed with serrated lateral margins. Uropodal base with produced medial margin; exopod and endopod both pointed with spines and plumose setae along the serrated margins. All peraeopods ambulatory although last four are laterally compressed with long plumose setae orginating on margin of basis; setae about as long as basis is wide. Many large plumose setae also originate on distal end of basis extending to middle of propodus. All other segments with some setae; dactylus minute. Antennae one with nine flagellar articles; antennae two with about 16 articles. Maxillipedal palp with three segments, endite very small. Mandible with toothed incisor, large lacinia mobilis, large toothed mandibular process. Palp with three articles, last two with many setae.

*Measurements:* Holotype female 8.0 mm long.

*Type locality:* 6851; Coronado Canyon; 812 m; Feb. 1, 1960; green mud. Lat. 32° 37′ 54″N, Long. 118° 55′ 40″W.

*Materials studied:* 6833(3); 6851(1).

*Distribution:* The species was taken in Tanner Canyon (at 813 m) and in Coronado Canyon from green muddy sand and green mud.

*Affinities:* The species differs from *Cirolana cubensis* Hay (Richardson, 1905), another blind species, in that its fourth pleonal segment is much wider and the apex of the telson is pointed. It is most like *C. gracilis* Hansen (Richardson, 1905), but *C. gracilis* has more definite peraeonal coxal plates and is not blind.

## Cirolana joanneae, n. sp.

(Plate 9)

*Cirolana joanneae* Schultz, 1964, p. 314, *nomen nudum.*

*Diagnosis:* Red eyes of moderate size. General body shape ovoid with truncate posterior margin. All body segments distinct and, with exception of pleonal segment one, with pointed posterolateral edges. Peraeonal segments two to seven with distinct coxal plates. Coxal plates forming lateral extensions, each anterior one extending laterally more than that of the preceding segment and continuous in general body outline with the recurved pleonal segment extensions. Pleonal segment five

shorter than others, but with lateral recurved extensions showing in the dorsal view. Telson with squarish posterior edge with medial ridge most of length of segment ending in medial spine. Other spines also present along margins; medial spine longest, medial lateral spines shorter and series of even shorter spines along the lateral edges of telson. Peraeopods all ambulatory with many stout setae. Eight flagellar articles on first antenna; 12 on second. First antenna extends to edge of first peraeonal segment; second to edge of third. Maxilliped with two large plumose setae on endite; many spines on segments of palp. Mandible with toothed incisor, small lacinia mobilis, and toothed molar process. Palp with three articles and apical setae; second article also with many setae. Uropodal base with produced inner angle; exopod about one-half as wide as endopod, but not extending as far posteriorward. Fringe of short plumose setae on margin on uropodal processes; telson with some larger plumose setae.

*Measurements:* Holotype female 3.0 mm long.

*Type locality:* 6806; Santa Cruz Canyon; 218 m; Dec. 22, 1959, rocks and some green sand. Lat. 33° 35′ 59″N, Long. 119° 15′ 11″W.

*Materials examined:* 6805(1); 6806(3).

*Distribution:* Santa Cruz Canyon at 218 m.

*Affinities:* The species can be distinguished from others of the genus by the general configuration of the telson with its medial ridge and pattern of spines, and by the recurved lateral extensions of the pleonal segments. It can be distinguished from *Cirolana harfordi* from the southern California maritime (Richardson, 1905) by the last pleonal segment, the lateral edges of which are not visible in the dorsal view.

## GNATHIOIDEA

## GNATHIIDAE

### Gnathia Leach

### **Gnathia crenulatifrons** Monod

*Gnathia crenulatifrons* Monod, 1926, pp. 390-393, figs. 154, 155.

*Gnathia crenulatifrons* Menzies and Barnard, 1959, pp. 27-29, fig. 22.

*Gnathia crenulatifrons* Schultz, 1964, p. 314.

*Materials examined:* 2361(10); 2789(2); 3000(1); 3180(2); 6823(1); 6832(1); 7054(6); 7174(9). (The numbers recorded are for males only.)

*Distribution:* Found within the depth and distribution ranges recorded by Menzies and Barnard (1959).

## **Gnathia clementensis**, n. sp.

(Plate 10)

*Diagnosis:* Eyes of medium size and stalked. Cephalon wider than long with many large tubercles. Entire width of peraeonal segment one barely visible in dorsal view. Frontal margin of cephalon with two medial lateral projections and with at least four small lobes on the median anterior projection. First three peraeonal segments and anterior part of fourth covered with tubercles. Body, especially anterior part, with many long hairlike setae. Pleonal segments with some tubercles and with two sets of pointed lateral projections. Pylopod triarticulate with minute apical segment; many large plumose setae along medial margin of opercular segment. First walking peraeopod with two sensory spines on propodus and one on carpus. Antenna one with seven flagellar articles; antenna two with five articles. Maxilliped with many large plumose setae along lateral margin; blade with two coupling hooks; blade slightly longer than third segment. Mandible large, when extended forward about three-fourths length of cephalon; cutting edge inconspicuously toothed. Pleopods without setae. Second male pleopod with small copulatory organ near base of endopod. Uropodal rami with many large lateral setae and with many long plumose setae; endopod longer than telson.

*Measurements:* Holotype male 8.5 mm long.

*Type locality:* 6840(1); San Clemente Canyon; 162 m; Jan. 30, 1960. "Campbell grab took small sample containing manganese nodules". Lat. 32° 44′ 35″N, Long. 118° 12′ 45″W.

*Distribution:* Known only from type locality.

*Affinities:* The new species is somewhat like *Gnathia productatridens* Menzies and Barnard (1959) but differs from it in the general structure of the frons, which is not produced and carries four lobes.

## **Gnathia coronadoensis**, n. sp.

(Plate 11)

*Diagnosis:* Eyeless. Body smooth without any conspicuous tubercles or hairlike setae. Cephalon longer than wide; posterior part raised with two large dorsolateral projections; anterior part of cephalon greatly depressed. Bottom of cephalic depression with prominent oval ring appearing to communicate with the mouth cavity below. Frontolateral superior process with spinelike setae on margin. First peraeonal segment continuous in outline with cephalon. Lateral margins of pleonal segments bent sharply downwards and slightly incurved. Telson acutely tri-

angulate with several spines on dorsal side. Pylopod with three segments (third minute); whole medial margin with plumose setae. First walking peraeopod with spine on ungus and series of tubercles along inner margin of propodus. Both antennae shorter than cephalon; first with seven flagellar articles; second with five articles. Maxilliped with many large plumose setae; setae longer than width of segment on which located. Mandible large, with lateral marginal notch and many well defined teeth. From lateral view mandibles look especially large because of deep cephalic pit. Pleopods with many plumose setae. Uropodal rami with many long plumose setae; endopod longer than telson.

*Measurements:* Holotype male 3.5 mm long.

*Type locality:* 6851; Coronado Canyon; 812 m; Feb. 1, 1960; green mud. Lat. 32° 30′ 42″N, Long. 117° 21′ 37″W.

*Materials examined:* 6849(1); 6851(1).

*Distribution:* Known only from the two specimens found in Coronado Canyon. The second specimen was taken at 344 m in green mud and gray mud with $H_2S$ smell.

*Affinities:* The species differs from most of the other *Gnathia* in the lack of conspicuous tubercles and hairs. The two specimens were small uncalcified animals.

## **Gnathia hirsuta**, n. sp.

(Plate 12)

*Diagnosis:* Eyes prominent, not stalked. Cephalon wider than long, covered with many tubercles. Whole body, especially anterior segments of peraeon, covered with long hairlike setae. Frontal margin of cephalon with acutely rounded medial projection. Frons with some lateral crenulations. Peraeonal segment one continuous in outline with cephalon, but prominent only in mediolateral region. Hairlike setae also found on basis of legs. Pleonal segments each with two (dorsolateral and ventrolateral) projections. Pleonal segment with stiff hairlike setae arising from posterior margins of the segments. Telson long with two pairs of setae, one near apex, another arising from apical margin. Pylopod triarticulate, apical segment minute; medial margin fringed with long plumose setae; ventral side covered with many long hairs. First walking peraeopod with single spine on dactylus. Antennae one and two about as long as cephalon; antenna one with seven flagellar articles; antenna two with five articles. Maxilliped with many plumose setae along lateral margin; two coupling hooks on the blade. Mandible acutely pointed with few teeth and without outer marginal notch. Pleopods without setae.

Uropodal rami both with large plumose setae; endopod about as long as telson.

*Measurements:* Holotype male about 4.0 mm long.

*Type locality:* 6805(1); Santa Cruz Canyon; 218 m; Dec. 22, 1959; rocks and some green sand. Lat. 33° 56′ 03″N, Long. 119° 52′ 03″W.

*Distribution:* Known only from type locality.

*Affinities:* The new species is very similar to *Gnathia crenulatifrons* Menzies and Barnard (1959), except that it has an acutely pointed projection from the anterior margin of the cephalon. The telson of *G. crenulatifrons* is short, not as produced as the telson of *G. hirsuta.*

### **Gnathia trilobata**, n. sp.

(Plate 13)

*Diagnosis:* Large unstalked eyes. Head with trifid frontal projection with stiff marginal setae. Peraeonal segment one conspicuous; complete width visible in dorsal view. Front half of body covered with many small tubercles, especially prominent on cephalon, anterior four peraeonal segments and postero-lateral border of segment six. Lateral extensions of pleonal segments increasingly more prominent posteriorly in dorsal view; telson produced in acutely rounded apex. Pylopod with three segments (third minute) with long plumose setae on margin and larger plumose setae on ventral side. First walking peraeopod with plumose setae on basis and at least one plumose seta on each segment except dactylus; sensory setae present distally on merus near carpal-meral joint. Both antennae about as long as cephalon; first with seven flagellar articles; second with five articles. Maxilliped with many plumose setae; blade with three coupling hooks, slightly longer than third segment. Mandible with several teeth and outer marginal notch; no setae on mandible. Pleopods without setae. Uropod with many large plumose setae arising from exopod and endopod; endopod and exopod shorter than telson.

*Measurements:* Holotype male 5.0 mm long.

*Type locality:* 6851; Coronado Canyon; 812 m; Feb. 1, 1960; green mud. Lat. 32° 30′ 42″N, Long. 117° 21′ 37″W.

*Materials examined:* 6851(2); 7049(1).

*Distribution:* Known from Coronado Canyon (type locality) and from La Jolla Canyon where it was taken from a polychaete tube in green sand and mud at 976 m.

*Affinities: Gnathia trilobata* differs from *G. tridens* of Menzies and Barnard (1959) in the presence of a longer frontal projection, and in other characters. It differs from *G. productatridens,* which it resembles most, in the lack of crenulations and setae on the outer marginal notch of the mandibles. No setal hairs arise from the mandibles and the telson is without setal spines.

## VALVIFERA

## ARCTURIDAE

### **Microarcturus** Nordenstam

### **Microarcturus tannerensis**, n. sp.

(Plate 14)

*Diagnosis:* Eyeless, pigmentless. Body, including proximal segments of peraeopods, covered with minute hairs. Whole body covered with projecting calcareous spines bearing large beadlike spheres. Cephalon and peraeonal segments with at least two large dorsal projecting spines and several dorsolaterally projecting spines. Last two peraeonal and first two pleonal segments with transverse row of at least six spines. Pleon of three segments, one being only partially separated from the pleotelson. Pleon shorter than last four peraeonal segments and with pointed posterior margin. Pleotelson with many short spines similar to those on peraeon. Two most lateral and posterior spines with large setae. First peraeopod somewhat chelate, bearing many sensory setae on inside margin and large spines on outside margin. First antenna with only four segments; distal segment dorsoventrally flattened, tipped with many setae and three times as long as preceding segment. Second antenna shorter than body, with each peduncular segment longer than preceding, ending in three increasingly shorter flagellar articles. Maxilliped with strongly curved palp carrying many plumose setae. Mandible with toothed incisor.

*Measurements:* Holotype female 5.5 mm long.

*Type locality:* 6832(1); Tanner Canyon; 1298 m; Jan. 28, 1960; green mud. Lat. 32° 33′ 36″N, Long. 118° 55′ 40″W.

*Affinities:* In general appearance the new species is most like *Microarcturus digitatus* Nordenstam (1933), except that the spines do not end in a point but have a beadlike tip. Spinal armature is most like that of *Antarcturus brunneus* as pictured by Nordenstam (1933).

## IDOTHEIDAE

### Synidotea Harger

### Synidotea calcarea, n. sp.

(Plate 15)

*Synidotea calcarea* Schultz, 1964, p. 314, *nomen nudum.*

*Diagnosis:* Abdomen bluntly rounded, spatulate with several small teeth on posterolateral margins. Tubercles in front of eyes and anteromedial tubercles submarginal; dorsum of head bearing two very large conical tubercles. Eyes not stalked, lightly pigmented with few ocelli. Peraeonal segments bearing two or three dorsolateral longitudinal rugae with two large mediolateral tubercles. Whole body covered with fine short hairs and margins of peraeonal segments and cephalon minutely serrated. Pleotelson crossed by three suture lines, indicating presence of four former segments; first pleonal suture continuous with grooves in lateral margins of pleotelson. Peraeopod one with long ungus; dactylus and propodus somewhat chelate. No peraeopods bearing projecting flanges on article two (basis). Antenna one with only four segments; antenna two with five peduncular and six flagellar segments. Maxillipedal palp much wider than endite; endite with several sensory setae. Mandible with toothed incisor; lacinia mobilis with setal row; molar process toothed. Endopod of maxilla one with two sensory projections. Uropods with two sensory dorsolateral setal spines.

*Measurements:* Holotype female 6.0 mm long.

*Type locality:* 6833; Tanner Canyon; 813 m; Jan. 29, 1960; green mud and sand. Lat. 32° 37′ 54″N, Long. 118° 58′ 40″W.

*Materials examined:* 6833(3).

*Distribution:* Known only from type locality.

*Affinities:* The new species is closely related to *Synidotea magnifica* Menzies and Barnard (1959), but it has fewer ocelli and less pigment and a less rugose appearance. Two very large rounded, conical tubercles are found on the cephalon between the eyes and there are fewer flagellar articles on the second antenna. The pleotelson is widest at the base in *S. magnifica* and at half its length in *S. calcarea.*

## LITERATURE CITED

BARNARD, K. H.

1925. A revision of the family Anthuridae (Crustacea Isopoda), with remarks on certain morphological peculiarities. Linn. Soc., London, Jour. (Zool.), 36:109-160, pl. 4, 10 text-figs.

DANA, J. D.

1854. Catalogue and descriptions of Crustacea collected in California by Dr. John L. LeConte. Acad. Nat. Sci. Phila., Proc., 7:175-177.

HANSEN, H. J.

1916. Crustacea Malacostraca III. The Order Isopoda. *In* the Danish Ingolf Expedition, Copenhagen. 3(5):1-262, 16 pls.

HATCH, M. H.

1947. The Chelifera and Isopoda of Washington and adjacent regions. Univ. of Washington, Pub. Biol., 10:155-274, 18 pls.

MENZIES, R. J.

1951. New marine isopods, chiefly from northern California, with notes on related forms. U. S. Natl. Mus., Proc., 101:105-156, figs. 9-33.

1962a. The zoogeography, ecology, and systematics of the Chilean marine isopods. Reports of the Lund University Chile Expedition 1948-49. 42. Lunds Univ. Årsskrift, N. F., Avd. 2, 57(11):1-162, 51 figs.

1962b. The Isopods of abyssal depths in the Atlantic Ocean. *In* Barnard, J. L., *et al.*, Abyssal Crustacea. Columbia Univ. Press, New York. (*Vema* Res. Ser. I) pp. 79-206, 74 figs.

MENZIES, R. J. and J. L. BARNARD

1959. Marine Isopoda on coastal shelf bottoms of southern California: Systematics and Ecology. Pac. Nat., 1(11):3-35, 28 text-figs.

MONOD, T.

1926. Les Gnathiidae. Soc. Sci. Nat. Maroc, Mém., 13:1-667, 1 pl., 277 figs.

NORDENSTAM, A.

1933. Marine Isopoda of the families Serolidae, Idotheidae, Pseudidotheidae, Arcturidae, Parasellidae, and Stenetriidae mainly taken from the South Atlantic. *In* Further Zool. Res., Swed. Antarctic Exped., 1901-1903. 3(1):1-284, 2 plates, 78 text-figs.

RICHARDSON, HARRIET

1905. A Monograph on the isopods of North America. U. S. Natl. Mus., Bull., 54:liii, 727 p., 740 figs.

SARS, G. O.

1899. An account of the Crustacea of Norway. Vol. II. Isopoda. Bergen Museum, Bergen, Norway. x, 270 p., 104 plates.

SCHULTZ, G. A.

1964. Some marine isopod crustaceans from off the southern California coast. Pac. Sci., 18:307-314, 4 text-figs.

STIMPSON, W.

1864. Descriptions of new species of Marine Invertebrata from Puget Sound, collected by the Naturalists of the North-west Boundary Commission, A. H. Campbell, Esq., Commissioner. Acad. Nat. Sci. Phila., Proc., 16:153-161.

Plate 1

Figure 1. *Acanthomunna tannerensis*, new species. 2. Third Peraeopod. 3. First Maxilla. 4. Second Maxilla. 5. Maxilliped. 6. Mandible. 7. First Antenna. 8. First Peraeopod.

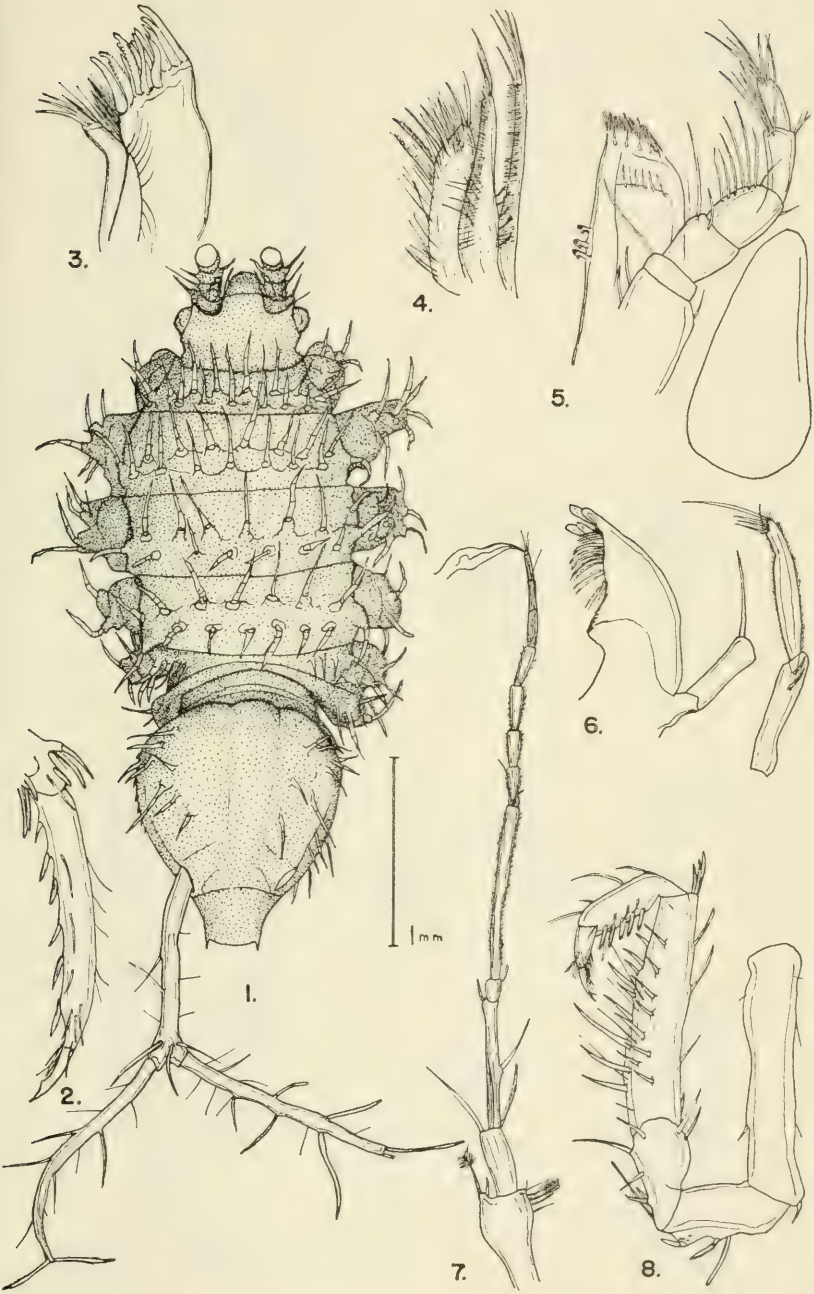

3.
4.
5.
1.
2.
1mm
6.
7.
8.

Plate 2

Figure 1. *Desmosoma symmetrica*, new species. 2. Maxilliped (two views). 3. Second Antenna. 4. First Maxilla. 5. Second Maxilla. 6. Mandible. 7. Hypopharynx. 8. First Peraeopod.

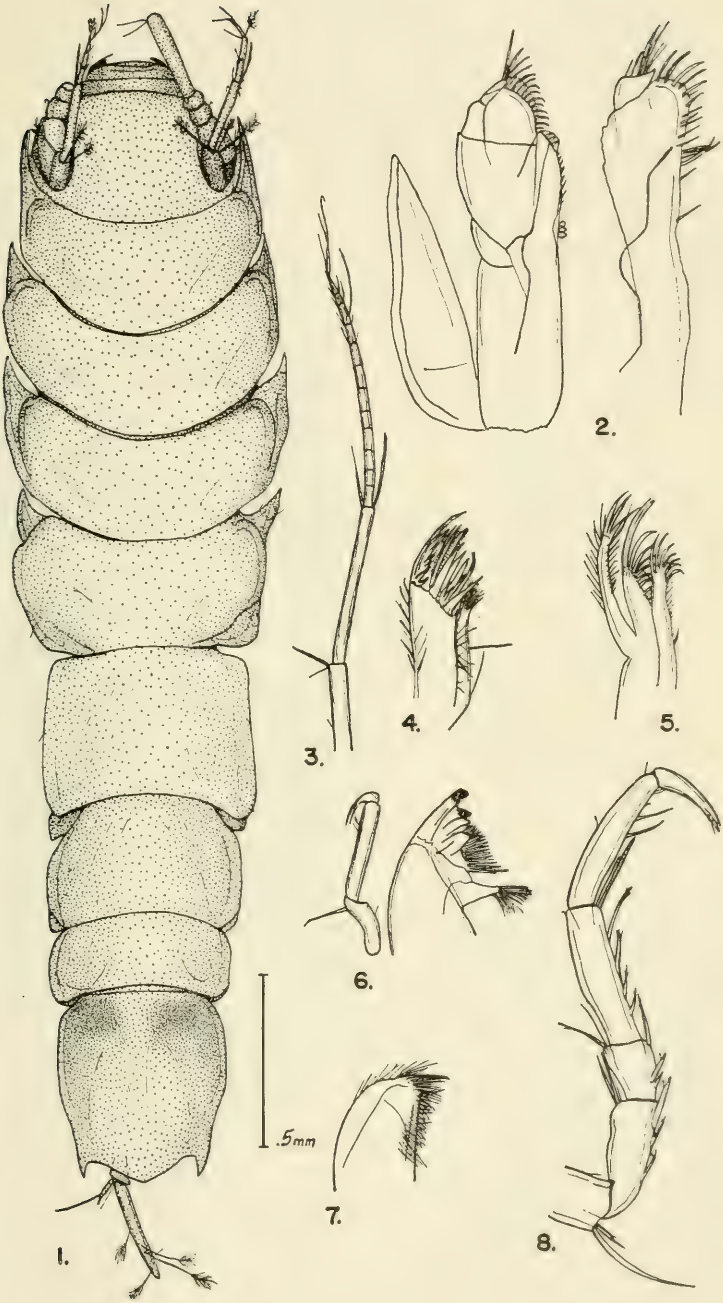

2.
3.
4.
5.
6.
7.
8.
.5mm
1.

Plate 3

Figure 1. *Eurycope californiensis*, new species. 2. First Maxilla. 3. First Antennal Base. 4. Second Maxilla. 5. Mandible (with detail of molar process). 6. Maxilliped.

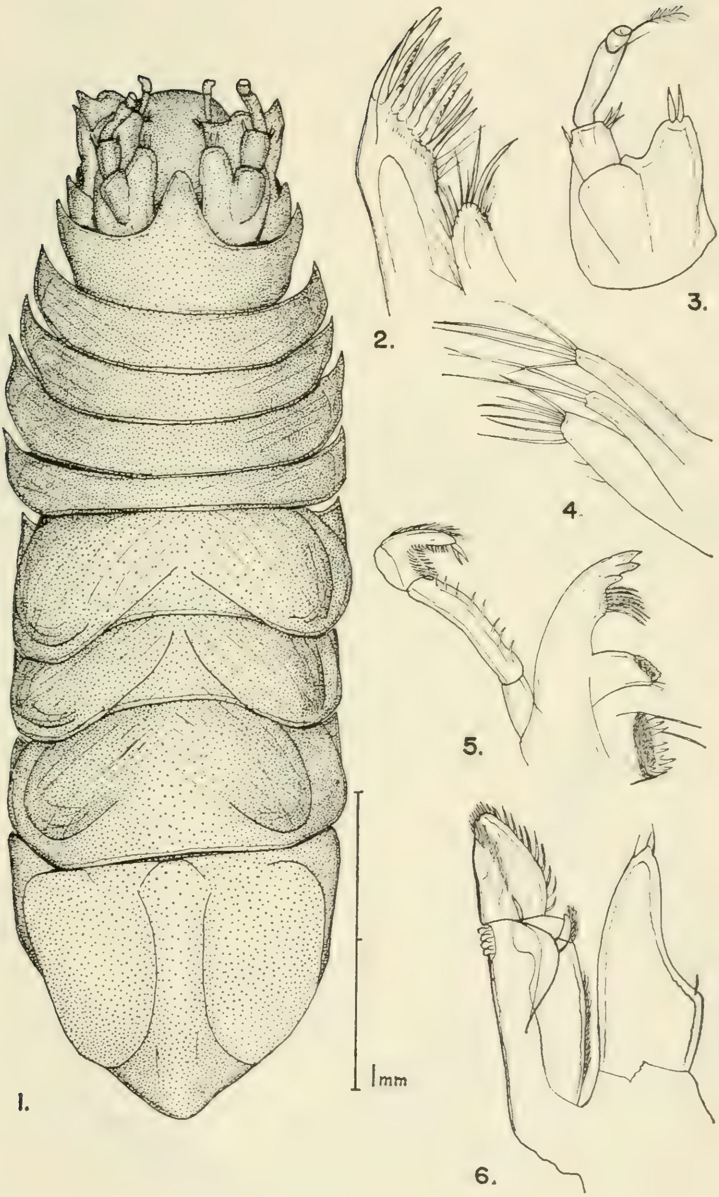

2.
3.
4.
5.
1mm
1.
6.

Plate 4

Figure 1. *Ilyarachna profunda*, new species. 2. Mandible. 3. Maxilliped. 4. Second Maxilla. 5. First Maxilla. 6. First Peraeopod. 7. First Antenna. 8. Second Male Pleopod (with copulatory organ). 9. First Male Pleopods (posterior tip).

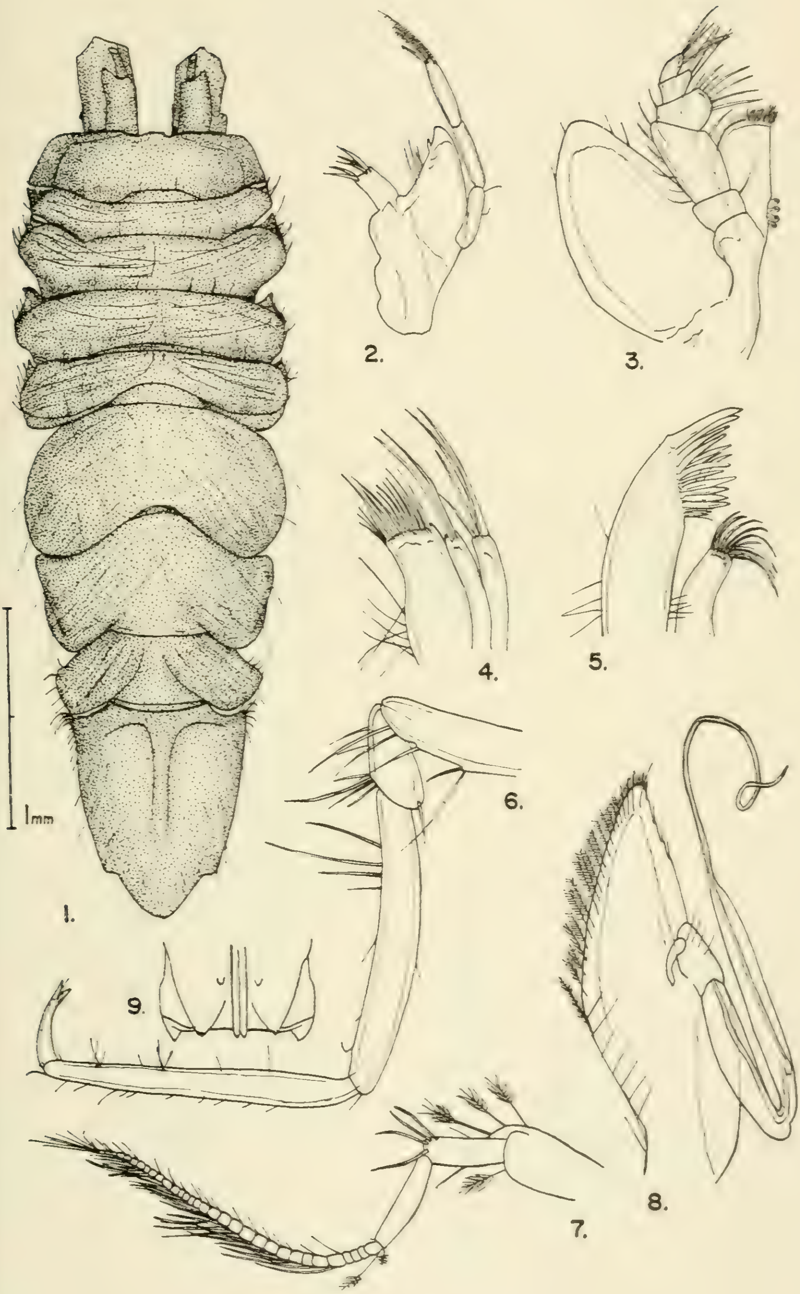

1mm
1.
2.
3.
4.
5.
6.
7.
8.
9.

Plate 5

Figure 1. *Jaeropsis concava*, new species. 2. Maxilliped. 3. First Maxilla. 4. Incisor Process of Mandible. 5. Second Maxilla. 6. Mandible. 7. First Antenna. 8. First Male Pleopods. 9. First Peraeopod.

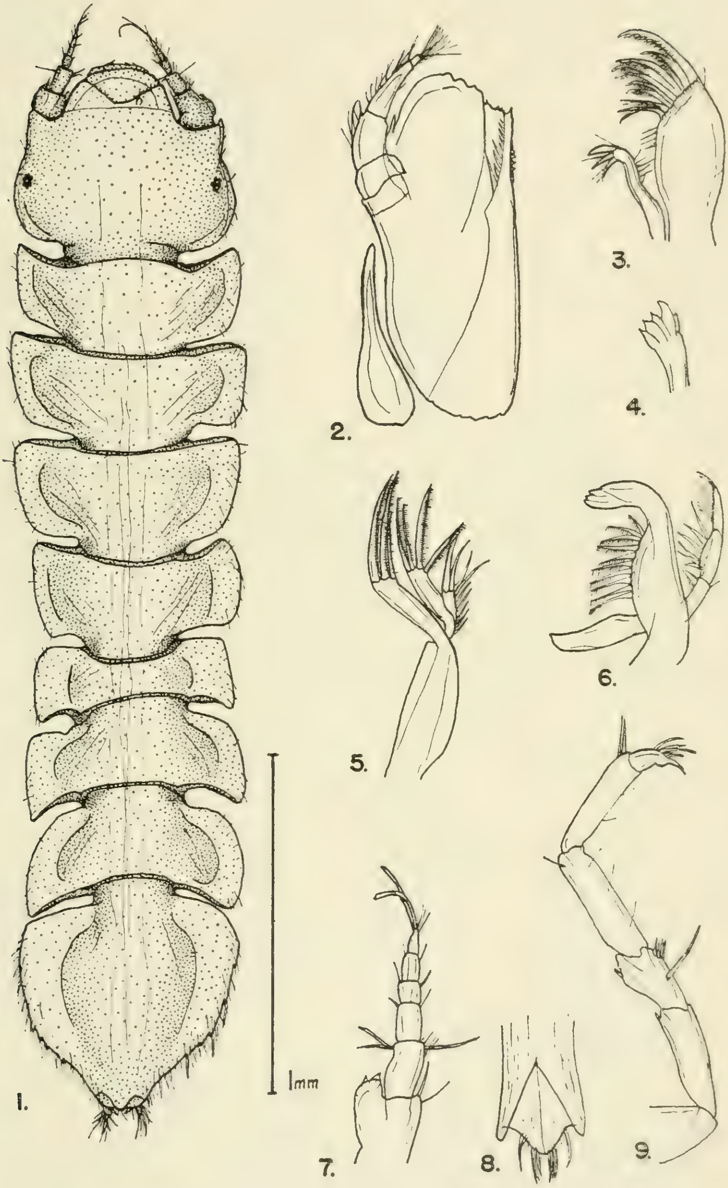

1.
2.
3.
4.
5.
6.
7.
8.
9.
1mm

Plate 6

Figure 1. *Nannonisconus latipleonus*, new genus, new species. 2. Maxilliped. 3. First Maxilla. 4. Second Maxilla. 5. Mandible. 6. Hypopharynx. 7. First Antenna. 8. First Male Pleopod. 9. Second Male Pleopod. 10. Uropod. 11. First Peraeopod.

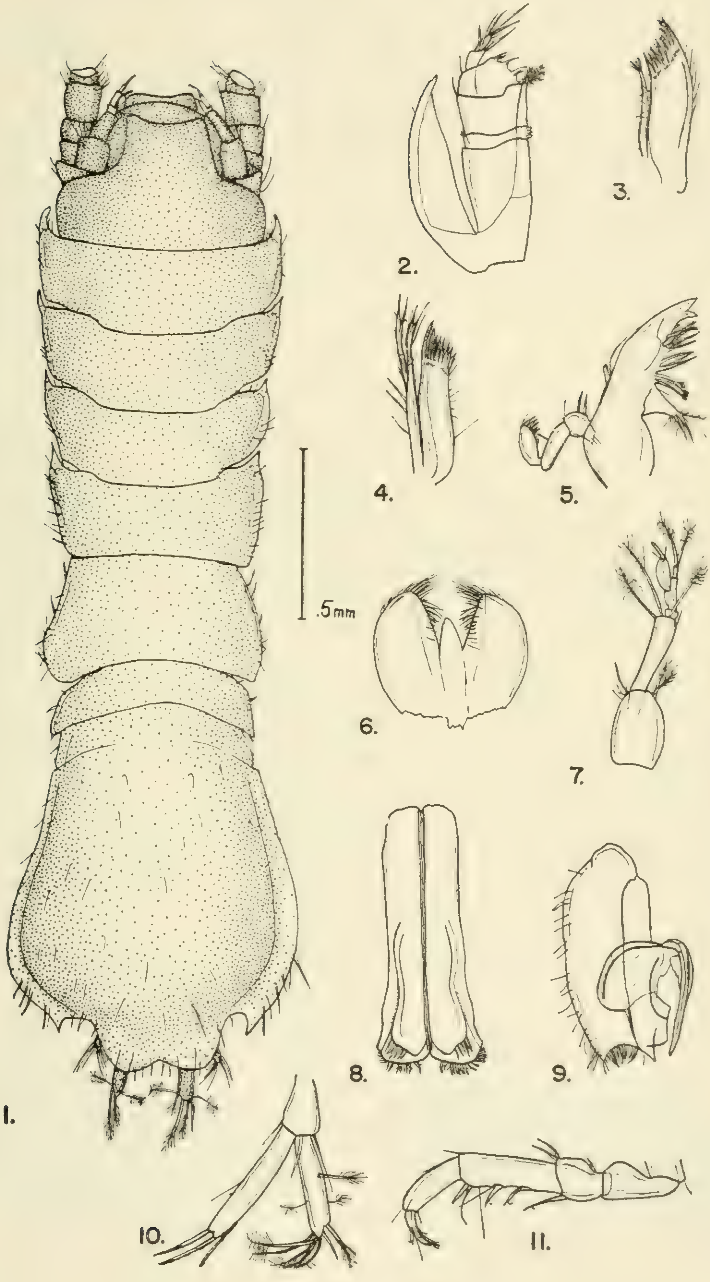

2.
3.
4.
5.
.5mm
6.
7.
8.
9.
1.
10.
11.

Plate 7

Figure 1. *Bathura luna*, new genus, new species. 2. Maxilliped. 3. Mandible (two views). 4. First Peraeopod. 5. First Maxilla. 6. First (a) and Second (b) Antennae. 7. Second Peraeopod. 8. Sixth Peraeopod. 9. Lateral View of Pleon.

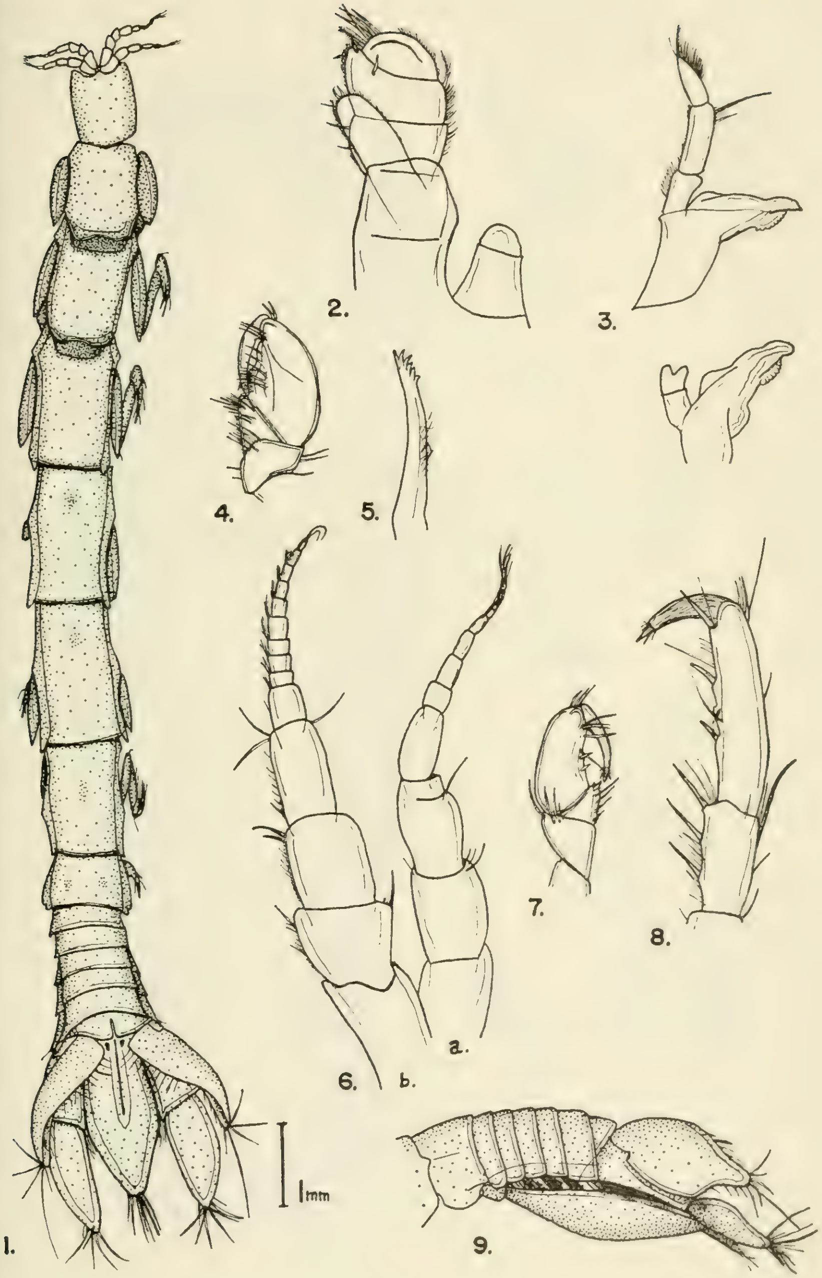

1.
1mm
2.
3.
4.
5.
6.
a.
b.
7.
8.
9.

Plate 8

Figure. 1. *Cirolana californiensis*, new species. 2. Maxilliped. 3. First Maxilla. 4. Mandible. 5. Second Maxilla. 6. First Peraeopod. 7. First Antenna. 8. Frontal Lamnia and Clypeus.

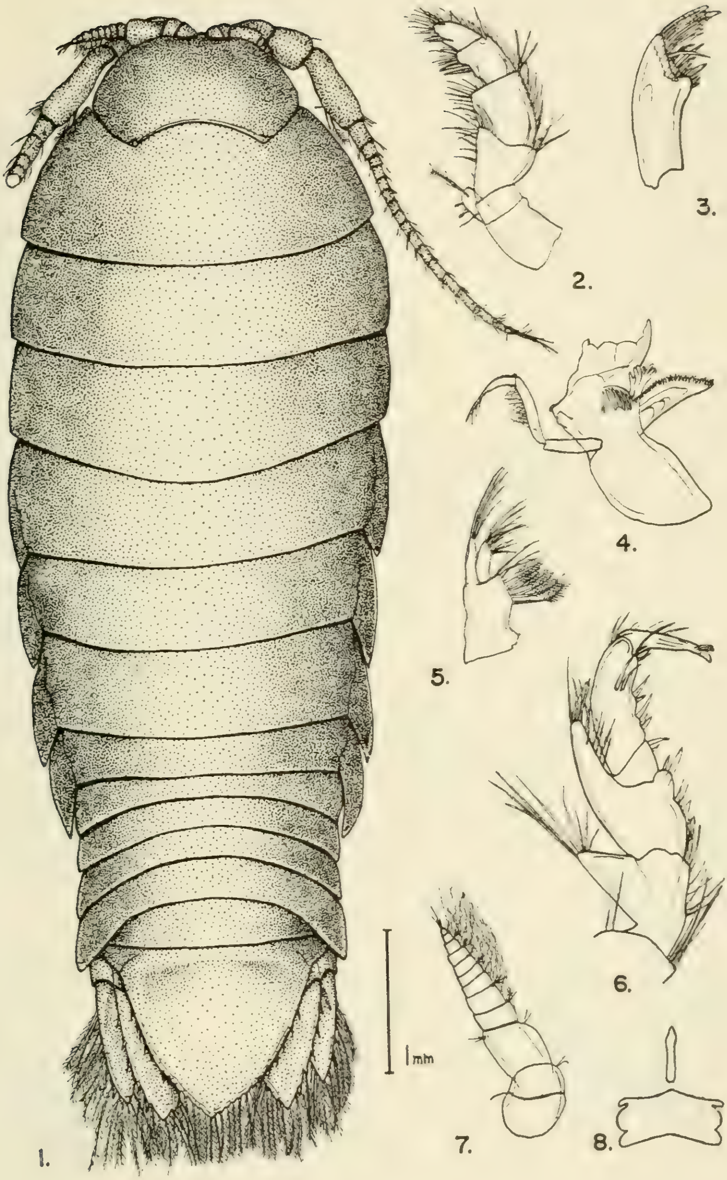

1.
2.
3.
4.
5.
6.
7.
8.
1mm

Plate 9

Figure 1. *Cirolana joanneae*, new species. 2. Third Peraeopod. 3. First Peraeopod. 4. First Maxilla. 5. Second Maxilla. 6. Mandible. 7. Maxilliped. 8. Pleopod (female). 9. Frontal View of Antennal Bases, Frontal Lamnia and Clypeus. 10. Uropod.

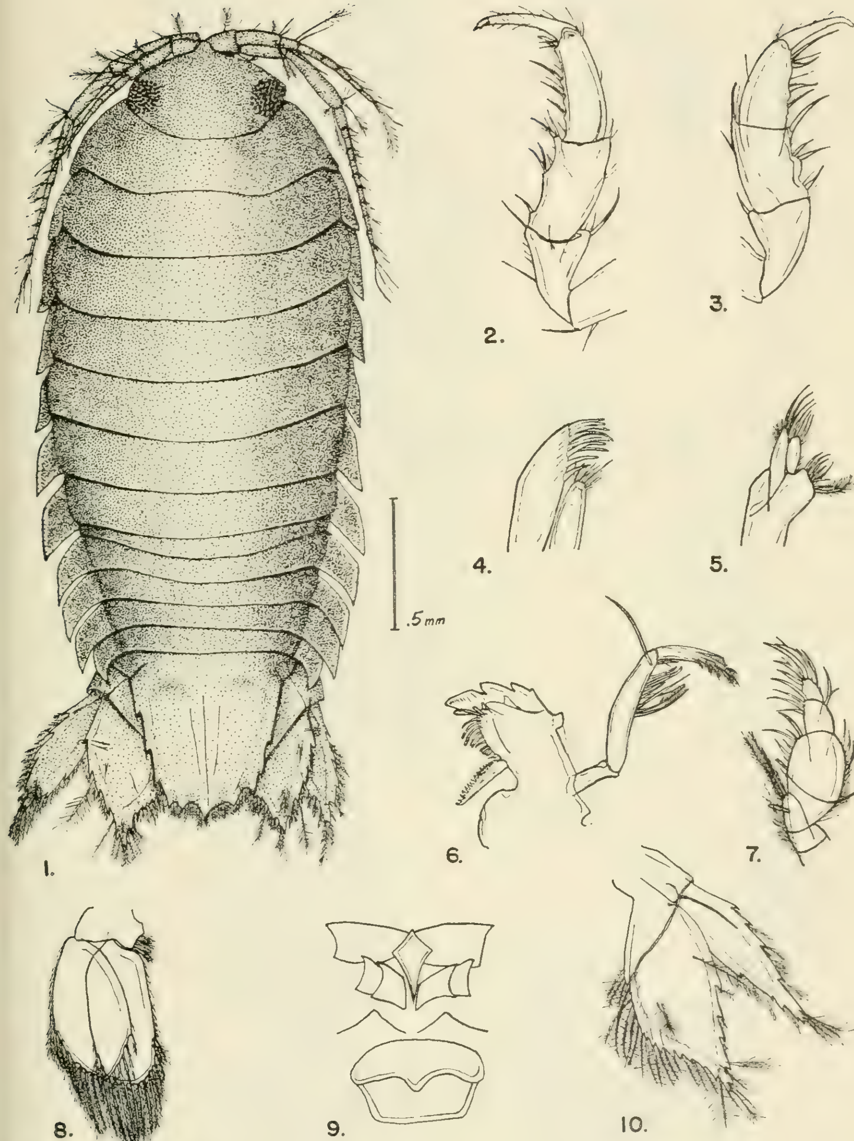

.5mm
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Plate 10

Figure 1. *Gnathia clementensis*, new species. 2. First Antenna. 3. Maxilliped. 4. Second Antenna. 5. Second Pleopod. 6. First Walking Peraeopod. 7. Pylopod.

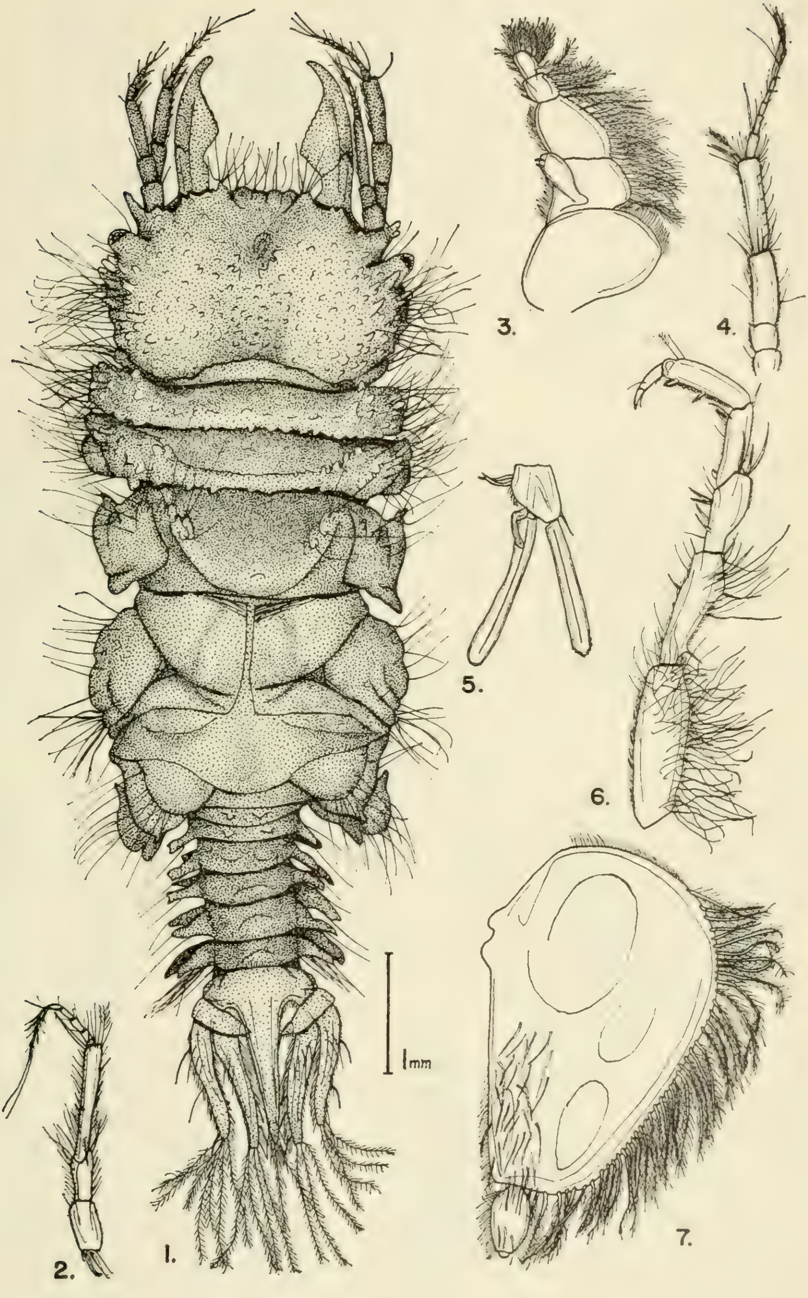

3.
4.
5.
6.
7.
1mm
2.
1.

Plate 11

Figure 1. *Gnathia coronadoensis*, new species. 2. Second Antenna. 3. Mandible. 4. Pylopod. 5. Maxilliped. 6. First Antenna. 7. Second Pleopod. 8. Telson and Uropods. 9. First Walking Peraeopod.

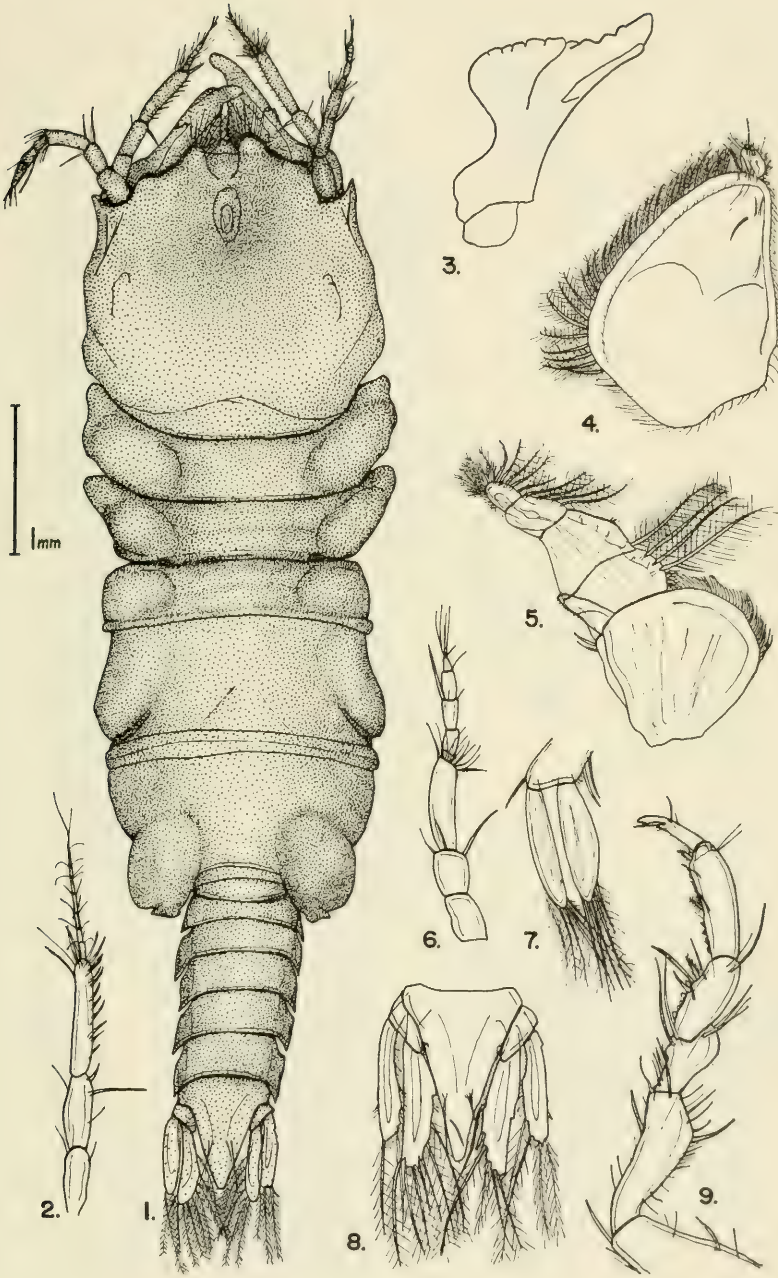

1mm
1.
2.
3.
4.
5.
6.
7.
8.
9.

Plate 12

Figure 1. *Gnathia hirsuta*, new species. 2. Second Antenna. 3. Maxilliped. 4. Mandible. 5. Second Pleopod. 6. Pylopod. 7. First Walking Peraeopod. 8. Telson and Uropods (with detail of telson apex).

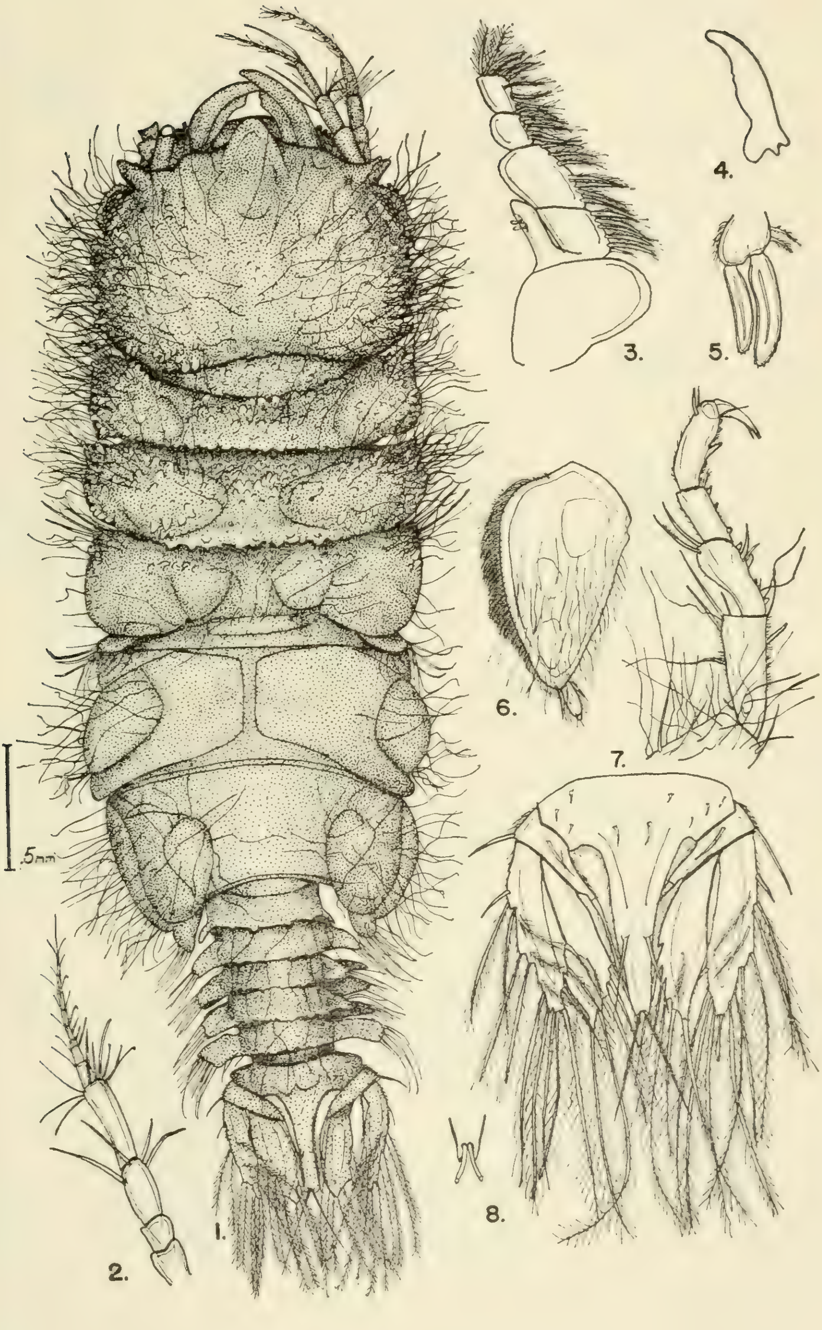

.5mm
1.
2.
3.
4.
5.
6.
7.
8.

Plate 13

Figure 1. *Gnathia trilobata*, new species. 2. Maxilliped. 3. Mandible. 4. Second Male Pleopod. 5. Pylopod. 6. Second Antenna. 7. First Antenna. 8. First Walking Peraeopod. 9. Telson and Uropod.

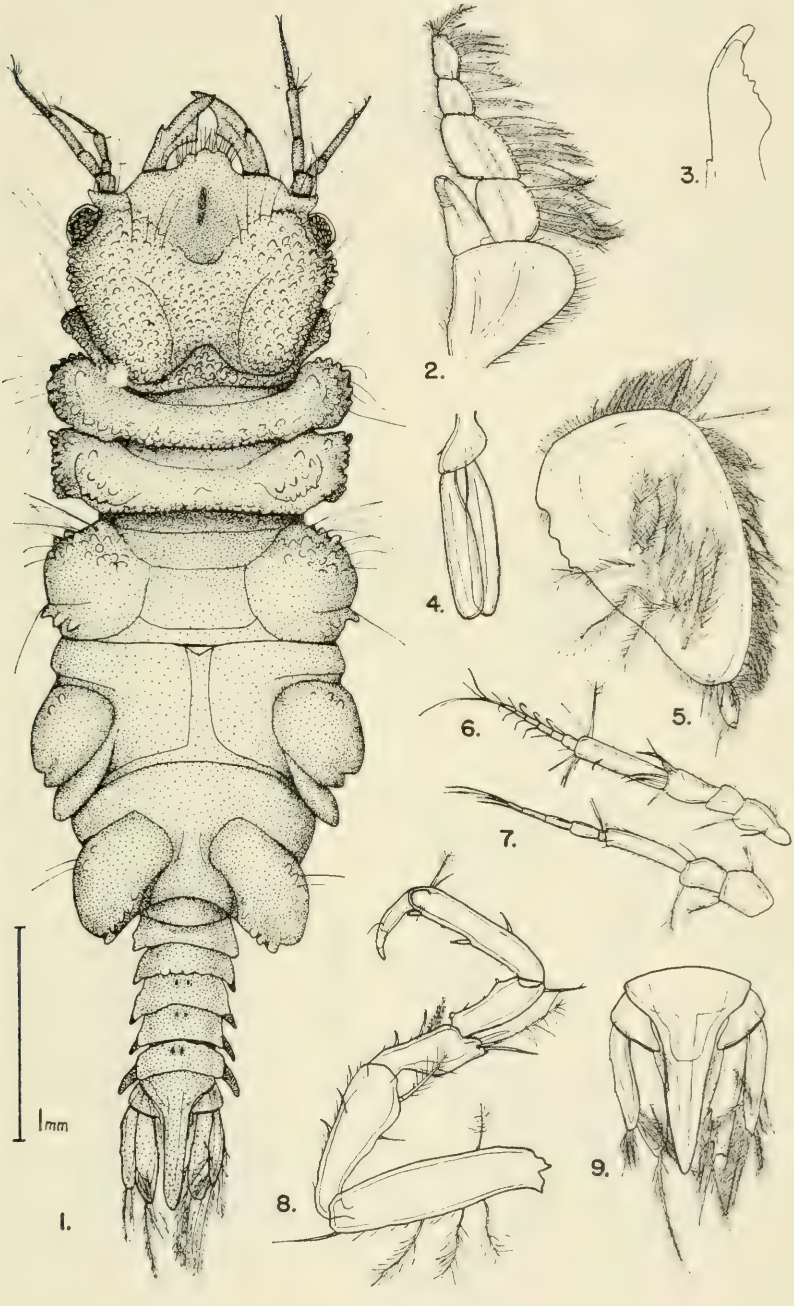

1.
2.
3.
4.
5.
6.
7.
8.
9.
1mm

Plate 14

Figure 1. *Microarcturus tannerensis*, new species. 2. Uropod (Valve). 3. Mandible. 4. Maxilliped. 5. First Maxilla. 6. Second Maxilla. 7. First Antenna. 8. Seventh Peraeopod. 9. First Peraeopod. 10. First Male Pleopods.

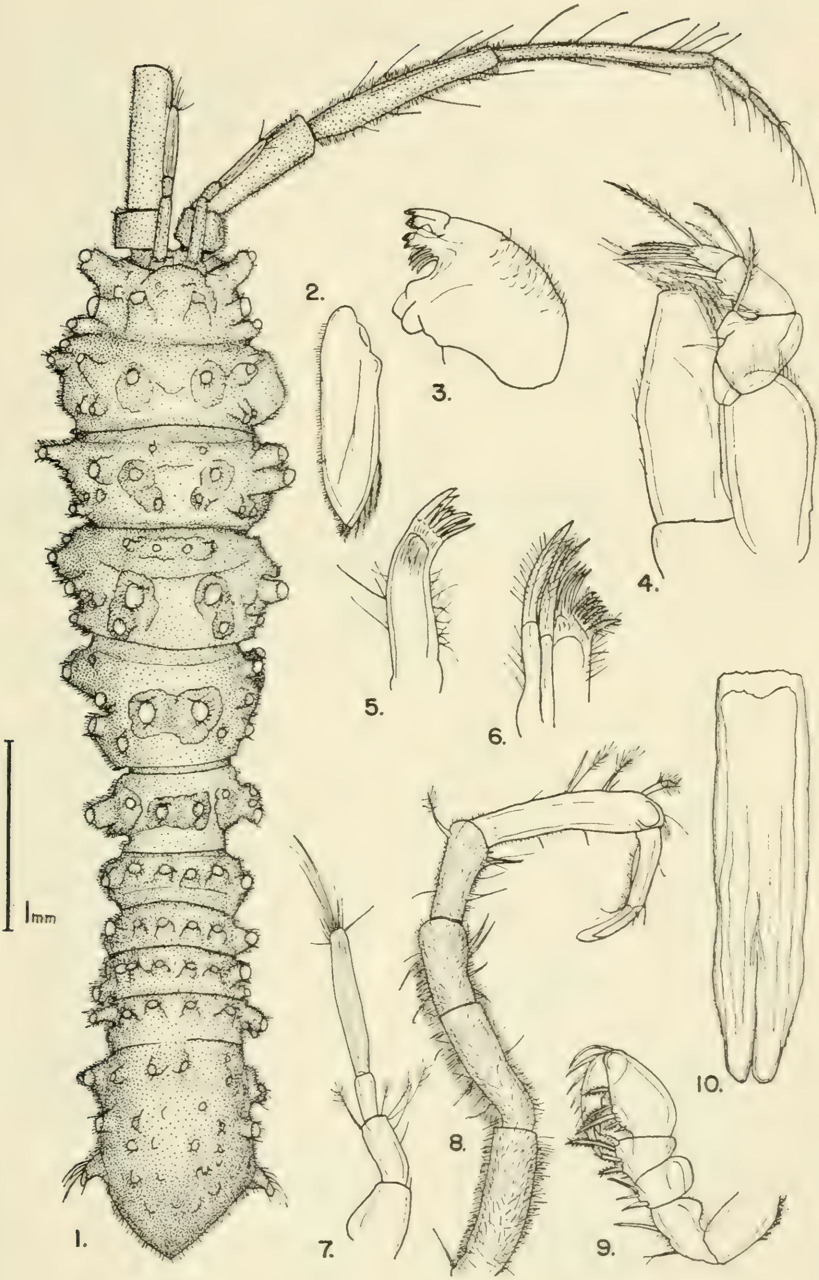
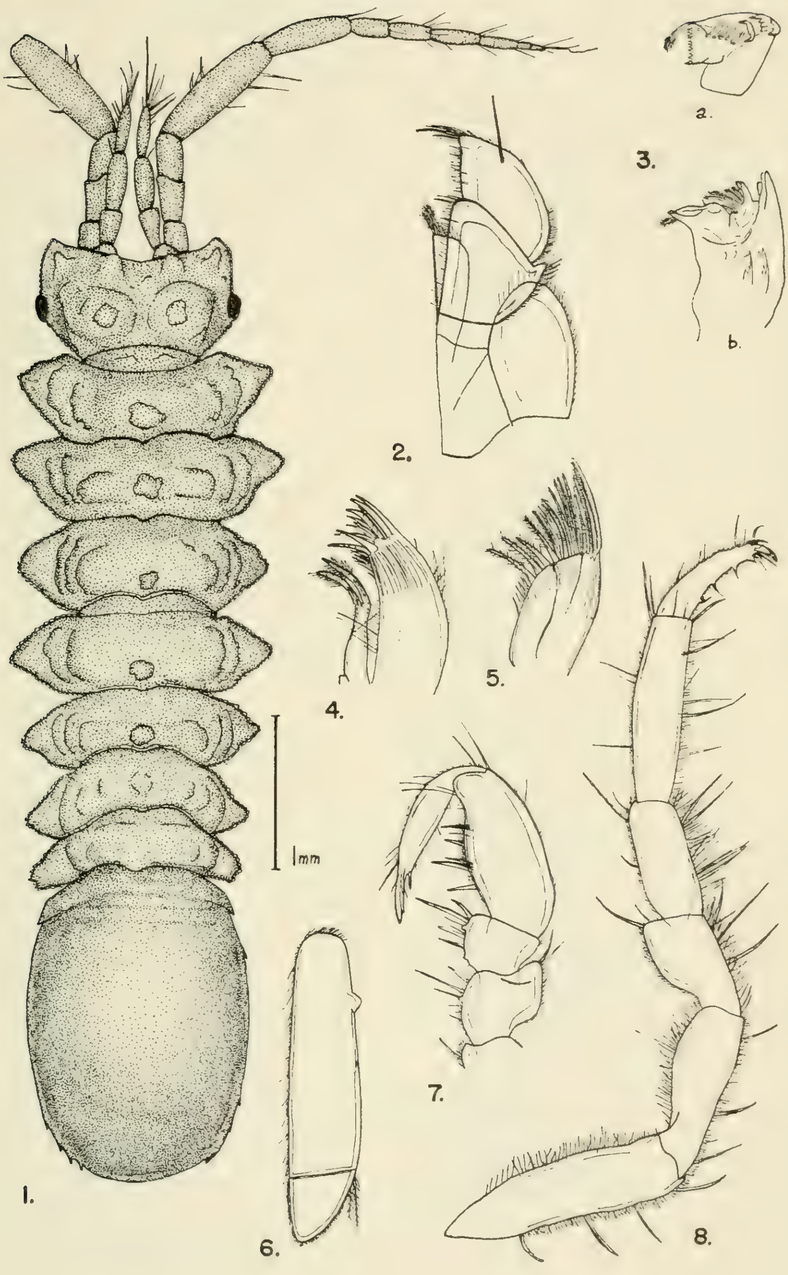

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
1mm

Plate 15

Figure 1. *Synidotea calcarea*, new species. 2. Maxilliped. 3. Mandibles; (a) apical and (b) lateral views. 4. First Maxilla. 5. Second Maxilla. 6. Uropod. 7. First Peraeopod. 8. Seventh Peraeopod.


1.
2.
3.
a.
b.
4.
5.
6.
7.
8.
1mm

# INDEX OF SCIENTIFIC NAMES

References to illustrations in **boldface** type.

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 27 PART 5

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## PART V

## SYSTEMATICS: AMPHIPODA

BY

J. LAURENS BARNARD

SMITHSONIAN INSTITUTION

WASHINGTON, D. C.



UNIVERSITY OF SOUTHERN CALIFORNIA

LOS ANGELES, CALIFORNIA

1966

ALLAN HANCOCK PACIFIC EXPEDITIONS

VOLUME 27 PART 5

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## PART V

## SYSTEMATICS: AMPHIPODA

BY

J. LAURENS BARNARD

SMITHSONIAN INSTITUTION
WASHINGTON, D. C.

UNIVERSITY OF SOUTHERN CALIFORNIA
LOS ANGELES, CALIFORNIA
1966

# SUBMARINE CANYONS OF SOUTHERN CALIFORNIA

## PART V

## SYSTEMATICS
## AMPHIPODA, by J. LAURENS BARNARD

Allan Hancock Pacific Expeditions

Volume 27
Part V

Issued: October 5, 1966

Price: $5.75

University of Southern California Press
Los Angeles, California

# CONTENTS

# BENTHIC AMPHIPODA OF SUBMARINE CANYONS AND BASINS OF CALIFORNIA

by J. Laurens Barnard

## INTRODUCTION

The shelf of southern California and its offshore islands is incised by numerous submarine canyons, many of which debouch onto trough and basin floors of the borderland area (Emery, 1960; Emery and Hülsemann, 1963). They are of particular interest to biologists, because they bring bathyal depths (200 - 1000 m) close to shore where food supplies might be higher than in comparable depths on the continental slopes. Their gradients and possibly their sediments are probably similar to those of regular continental slopes, although sediments of the slopes in southern California have not been well explored (Emery, 1960).

Where canyon heads come close to shore, sand moved by longshore currents is entrapped and flows down canyon axes. Sediments accumulating on the shoreward canyon floors occasionally are set in motion as turbidity flows, possibly either as the result of seismic activity or because of increments in overburden. These sedimentary masses, mixed with water, flow down the canyon axes and in certain canyons flow onto the fans of submarine basin slopes (Emery and Hülsemann, 1963). An inherent catastrophic unstability to the substratum of the biota proves worthy of examination.

Particularly interesting is the opportunity to report upon bathyal gammaridean amphipods collected in quantitative samples. Because the canyon bathyal fauna merges with that of the subsill and somewhat impoverished borderland basins, amphipod assessments already published by Hartman and Barnard (1958, 1960) have been perfected and included herein, along with data from the continental slopes that have accumulated from examination of samples reported upon by Hartman (1955).

## METHODS AND MATERIALS

Benthic samples, primarily from the canyon axes, were collected either with an orange-peel grab or a Campbell (modified Van Veen) grab from 1952 to 1962 in the following canyons from north to south along the mainland shelf: Monterey, Hueneme, Mugu, Dume, Santa Monica, Redondo, San Pedro Sea Valley, Newport, La Jolla and Coronado. The following insular canyons were sampled: Santa Cruz, Santa Catalina, Tanner and San Clemente Rift Valley. Samples were also taken in the San Diego Trough. These 201 samples, plus a few additional basin and slope samples, supplement the basin samples discussed by Hartman and Barnard (1958, 1960) to form the basis of the present treatment of the amphipod fauna. Hartman (1963) has already discussed the polychaetes and general faunistic condition of the canyon samples.

The orange-peel grab collected at each station a plug of sediment with a surface area of about 0.25 $m^2$ and the Campbell grab about 0.55 $m^2$. The depth of penetration of the grabs varies but this is considered to be inconsequential in the collecting of Amphipoda as most of the organisms are presumed to inhabit the upper few centimeters of the substrate. A few listriella Amphipoda may inhabit the deeply thrust tubes of maldanid polychaetes. Deeply burrowing organisms of groups other than Amphipoda are of course sampled erratically by benthic grabs, depending on the compactness of the substrate. Therefore, the values of standing crop and frequency of organisms are only approximate; absolute values await the invention of a perfect sampler. Equation of samples according to their areal coverage is acceptable in view of the commonly practiced comparison of various marine communities in the literature regardless of type of sampler.

After recovery, samples were washed aboard ship (R/V VELERO IV) through a screen of 0.7 mm mesh and the residues preserved for sorting in the laboratory. Sedimentary volumes of samples are reported by Hartman (1963).

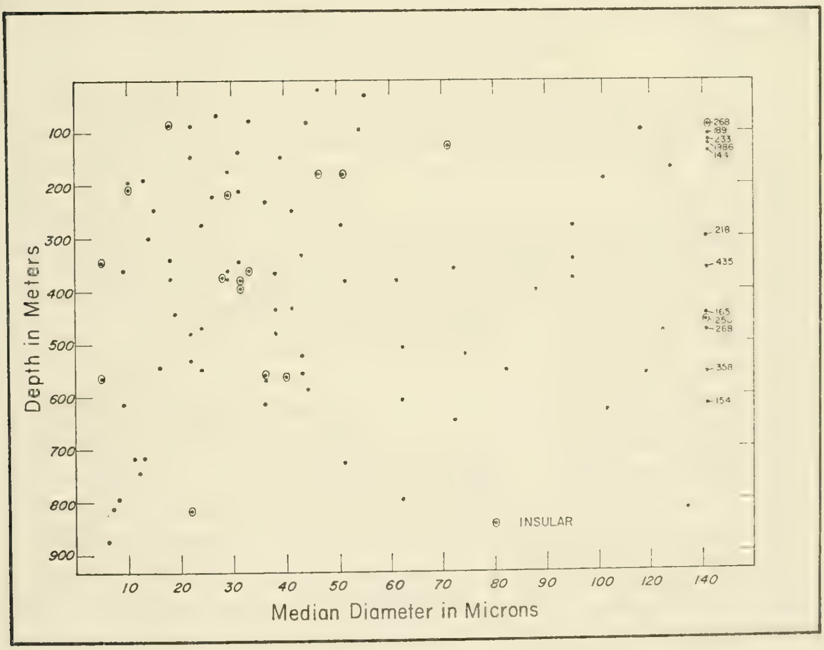
The faunal composition of canyon samples is extremely variable and can be associated only sketchily with depth and assumed thermal provinces, sediments, geomorphology and distances from shore (as based on USHO charts). Mapping and sampling of canyons must be continued on a larger scale than at present but restricted to smaller regions and shorter time scales before valid correlations can be made between biotas and environmental parameters.

Usage of the term "community" in this paper conforms to the Petersen concept (Thorson, 1957).

# THE CANYON ENVIRONMENT

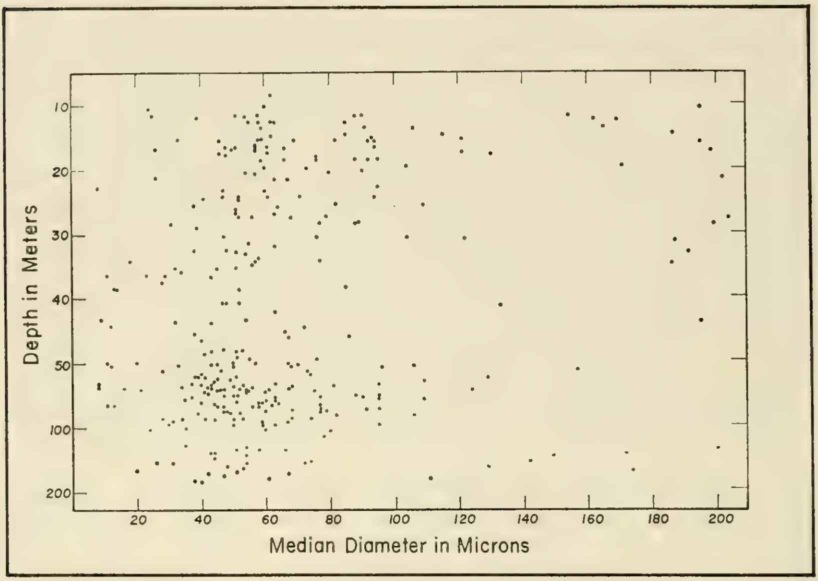
## Physical

Although turbidity currents are known to sweep down canyon axes (Emery, Hülsemann and Rodolfo, 1962; Johnson, 1964), and rather continuous cascades of sand pour into canyon heads (Dill, 1962), the lasting deleterious effects appear to be minor, as most canyon samples reported upon herein and in Hartman (1963) contained significant animal populations. However, none of the samples is known to have been taken from an area of recent disturbance. Occasionally samples showed evidence of impoverished faunas, but indicator species point to the presence of outflowing fresh water from exposed aquifers (Hartman, 1963). A great diversity of canyon sediments occurs even though canyon heads entrap medium sands of shallow water. Emery and Hülsemann's (1963) data for canyons 0 - 50 m above axes (plotted in Graph 1 as a scatter diagram, and averaged in Table 1) show the great range in median par-




Graph 1. Scatter diagram of axial canyon sediments (0-50 m above axes) in California. Plain dots represent inshore coastal canyons, dots enclosed with circles represent insular canyons. Data from Emery and Hülsemann (1963).

ticle diameter of the sediments. One may compare the scatter diagram of median diameters for the coastal shelf shown in Graph 2.




Graph 2. Scatter diagram of sediments from samples proportionally distributed by depth and area on the coastal shelf of southern California, 10-183 m.

Emery, Hülsemann and Rodolfo (1962) believe that the net result of turbidity flows is of benefit to benthic populations, especially on the aprons at the seaward ends of the canyons and below sill depths of the basins. There, of course, the muddy suspensions bring down water with higher than normal oxygen content, as well as quantities of organic matter. Water of high oxygen tension can be detected as long as two years later. and this may be of some influence on canyon populations above sill depths in or near the oxygen-minimum layer of the sea. The concept that canyons, through frequent sedimentary movements, provide more organic matter for bathyal biota than do continental slopes at the same depths may have a relationship to the survival of refugees from a pre-cooled abyssal realm. The enormous variability of canyon sediments also would provide a diversity of niches for an ancient fauna possibly compressed into bathyal depths (see Bruun, 1957; Madsen, 1961; Menzies and Imbrie, 1957; Zenkevitch and Birstein, 1960; and J. L. Barnard, 1961b, 1962d, for notes on the bathyal theory). If 84% of the ocean floor known as abyssal once supported a warm-water fauna of

great antiquity that, because of cooling of the deep-sea, found refuge in 8% of the sea floor at bathyal depths, then one must balance the consequences of greatly decreased living space against a higher food supply per unit of area. Elucidation of the organic-matter cycle awaits experimental methods and solution of the uniformity: thermostrophic controversy awaits new methods and additional careful study of deep-sea faunas.

Large particles of organic matter have been discovered frequently in samples from nearshore basins and trenches (Bruun, 1959; Heezen, Ewing and Menzies, 1955) and in the present samples, especially those from Monterey Canyon (see data, Hartman, 1963). Such accumulations must indicate that low-density organic matter is transported more quickly and frequently to great depths in canyons before decomposition, than is mineral matter. That organic accumulations probably are disposed of by organisms rapidly is shown in the similar organic carbon content of canyon and shelf sediments (Table 1), for if biota (including bacteria) were not disposing of organic matter quickly, the canyon sediments would have much higher organic contents. Nevertheless, the samples containing macroscopic pieces of organic debris have not borne large populations of organisms. This has been observed also in the large accumulation of organic debris off the Santa Clara River on the Ventura coastal shelf, where sediments contain twigs and stems transported from land by the river, probably in great quantities after brush-fires. Here the normally expected high densities of ophiuroids and other characteristic community dominants have been reduced considerably. Most of this debris probably contains a high content of insoluble and poorly-digestible residues that few Metazoa are adapted to utilize. Whether it has a toxic effect on benthic populations or whether its presence makes the sediments more difficult to burrow into are problems for experimentation.

After a turbidity flow, a portion of the formerly buried and labile organic materials that are resuspended probably settle out as a veneer covering the sediments and become available to the first animal immigrants. Perhaps in Monterey Canyon this had occurred just before sampling that poorly diverse population, largely composed of motile organisms such as amphipods and cumaceans. The densest accumulations of debris, fragments larger than 0.5 mm, apparently consisting of surfgrass or eel-grass, were taken at stations 6490 and 6494, in depths of 906 and 750 m respectively. The most conspicuous and dominant organisms were *Protomedeia articulata*, a large amphipod, with 20 and 111 specimens, respectively, and *Leucon* sp., a cumacean. The problem re-

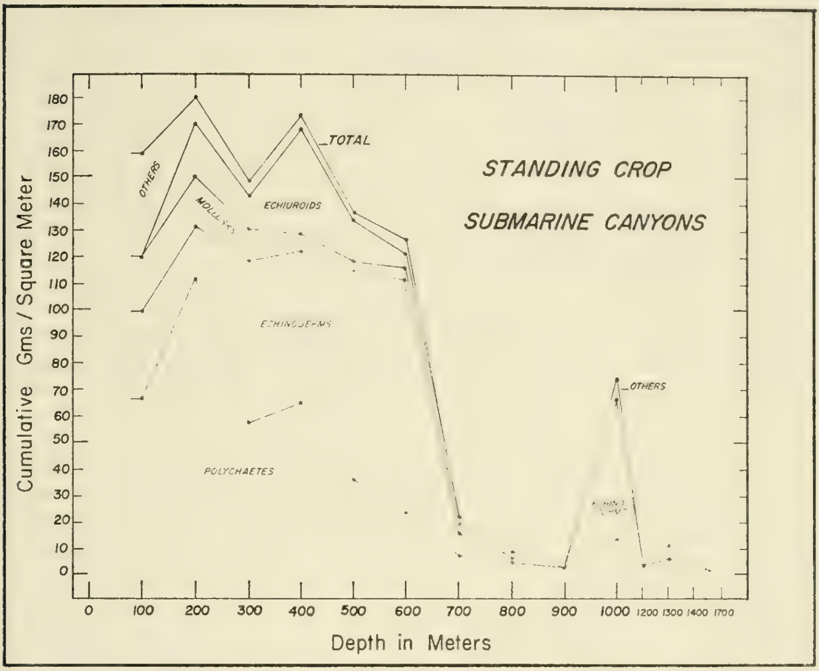
mains whether a turbidity flow scatters organic material so widely that no accumulation as dense as that in Monterey Canyon would result after settling. The grassy material appeared remarkably fresh, although it was greenish-black. Pockets full of debris in areas of high repose may have been accumulated through mechanisms other than movement of sediments. Perhaps gradients are sufficient in some canyon axes to permit cascading and saltation of debris, but continuing impulsion by water movement would have to be presumed. Descending currents in canyons have not been demonstrated, although they might be predicted, especially where canyons intersect lagoons. Because of evaporation and winter cooling of water in shallow lagoons, density currents might be established that flow slowly part way down the canyon axis. Indeed, Monterey Canyon impinges upon the mouth of Elkhorn Slough (hydrographic conditions poorly known). The only other canyon with evidence of high accumulation of organic material is Newport Canyon, from which came several samples composed of black sulfide ooze. Coincidentally, that canyon lies near the mouth of Newport Bay, another lagoon supporting eel-grass (but not as densely as at Elkhorn Slough, because of human influences). Another conjecture is that canyon topography influences formation of surface-water eddies in which organic material is trapped, becomes waterlogged and sinks to the canyon floor.

Off the Congo River (*Vema* samples, information from Dr. R. J. Menzies) one may presume that debris accumulates in the canyon simply from waterlogging of enormous supplies that are present. But the canyons of California are not served by large rivers, hence their source of organic matter has to lie elsewhere.

## Biological

### STANDING CROP

Individually, the several canyons with their distinct profiles and different distances from shore are difficult to compare. The small number of samples per canyon adds to this difficulty, because patchiness of sediments and therefore patchiness of biological distributions occur. This is well demonstrated in the erratic recovery of brissopsid urchins. Even the levels of polychaete standing crop differ enormously and inconsistently at similar depths in each canyon, although consistency with sediment-type is apparent, the finer sediments supporting larger crops. By grouping all of the canyon samples, regardless of the artificiality so incurred, a significant impression of the trend of decreasing crop with depth is seen




Graph 3. Cumulative standing crop in submarine canyons related to depth, data reduced from Hartman (1963).

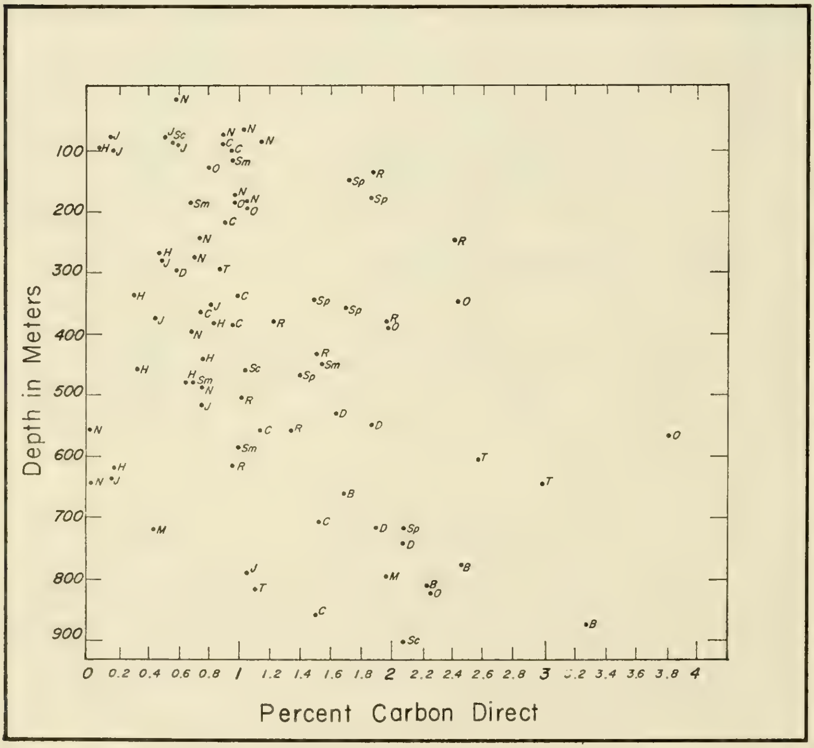
(Graph 3), because sufficient samples are grouped into several depth classes so as to ameliorate erratic biomass levels. Most striking and perhaps significant is the sudden drop in biomass between 600 and 700 m that may be related to the oxygen minimum layer which occurs between 500 and 700 m in this latitude (Emery, 1960, p. 108).

The standing crop of the depth classes of 100 - 500 m in the canyons approximates that of the typical levels on the outer sandy-silt (or silty-sand) shelf of southern California (compare Barnard and Hartman, 1959, figs. 4-6), in depths of about 60 to 100 m. Echinoderms and echiuroids represent a larger share of the standing crop in canyons than they do on the outer shelf, this share being taken partly from the polychaetes and especially from the mollusks.

## DENSITY OF ORGANISMS

Polychaetes dominate the benthos of the inshore continental canyons whereas echinoderms are numerically more abundant in the insular canyons (Tables 2-3, by summation of values in all depth classes). The

data of these tables are computed from figures presented in Hartman (1963), assuming that the Campbell grab covers an area of 0.55 $m^2$ and the orange-peel grab 0.25 $m^2$. The tables give trends and approximations rather than absolute values, because the various depth classes of each canyon have not been exhaustively sampled to the point of diminishing returns of previously unassessed variability. The abundance of polychaetes and echinoderms in the canyons in depths of 0-200 m closely approximates the averaged density for the coastal shelf (Table 4), but mollusks are slightly less and crustaceans are much less abundant in the canyons. The insular canyon sediments apparently are not significantly different in grain size from those of mainland canyons, as shown by the scatter diagram (Graph 1) of median diameters, although they appear to have slightly higher carbon percentages (Graph 4) or are, at least, on




Graph 4. Scatter diagram of axial canyon carbon percentages in sediments, quoted as percent carbon direct. Symbols of canyons: C = Catalina, D = Dume, H = Hueneme, J = La Jolla, M = Mugu, N = Newport, O = Coronado, R = Redondo, SM = Santa Monica, SP = San Pedro sea valley, T = Tanner, B = basin below sill depth. Data from Emery and Hülsemann (1963).

the high side of the scatter diagram. To some extent the low number of crustaceans in canyon heads (Table 3) may be the result of sampling errors, although a large proportion of the samples was taken with the Campbell grab which presumably does not suffer much loss of small motile organisms.

The very low recoveries of mollusks in the shallow parts of the insular canyons seem significant. The low recovery of crustaceans in all of the canyons, plus their division into so many orders, results in such scanty material that general statements about crustacean community ecology cannot be made. Depth zonation is apparent however.

## COMMUNITY ASSEMBLAGES

Canyon samples are dominated by the following organisms: *Pectinaria californiensis*, *Maldane sarsi*, *Capitella capitata*, *Chloeia pinnata*, *Pista disjuncta*, *Dentalium rectius*, *Heteromastus filobranchus*, *Ancistrosyllis tentaculata*, *Spiophanes fimbriata* and *Nothria iridescens* and *Lysippe annectens*. All are polychaetes except the scaphopod *Dentalium*. Large and conspicuous, but not in great abundance, are the following: *Brissopsis pacifica* and *Brisaster townsendi* (echinoids); *Arynchite* sp. and *Listriolobus pelodes* (echiuroids); *Cerebratulus* sp. (nemertean); *Solemya* sp., *Yoldia* sp. (clams); *Asychis disparidentata*, *Glycera americana*, *G. robusta*, *Onuphis vexillaria*, *Lumbrineris* sp. and *Praxillella pacifica* (polychaetes). The depth zonation of some of these and of other important species is depicted in Graph 6. The eurybathicity of these species is striking.

Table 5 lists the communities found on the coastal shelf of southern California, in order of their importance. The occurrence of these community types in the canyons is insignificant except for *Capitella*, a genus that is more frequently abundant in canyons than on the coastal shelf. The most important canyon species is *Pectinaria californiensis*, which on the shelf is a subdominant of the *Amphiodia urtica* and *Amphiodia-Cardita* communities.

The codominant frequency (Graph 5) suggests those samples to be tested for community appellations and they have been selected by inspection of the lists published by Hartman (1963). No group of stations is large enough to ensure statistical uniformity, but as assembled they show considerable differences in the frequency of the various species (Table 6). Of 109 stations of the inshore (coastal, non-insular) canyons, 78 can be assigned to one of the nine different associations. Most of

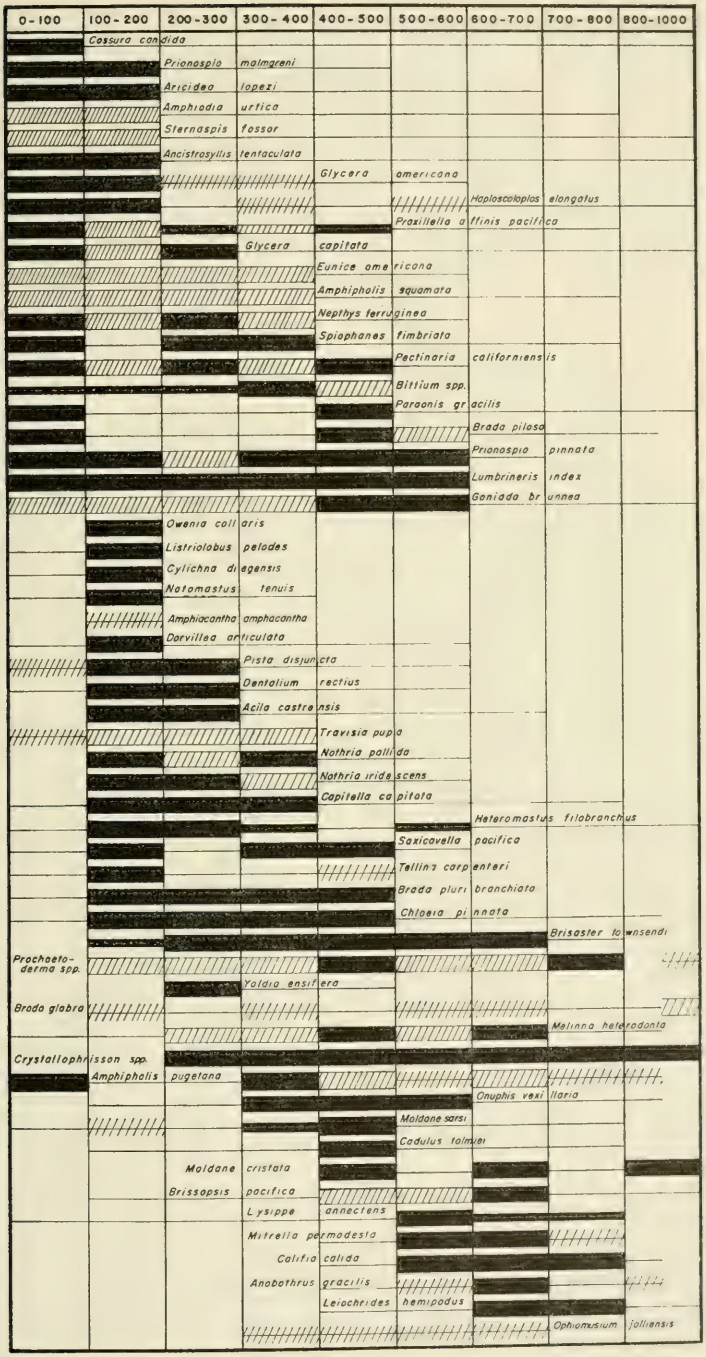
| | Pectinaria | Maldane | Capitella | Chloeia | Pista | Dentalium | Heteromastus | Ancistrosyllis | Spiophanes | Nothria |
|---|---|---|---|---|---|---|---|---|---|---|
| *Pectinaria californiensis* | 24 | | | | | | | | | |
| *Maldane sarsi* | 2 | 9 | | | | | | | | |
| *Capitella capitata* | 3 | 0 | 9 | | | | | | | |
| *Chloeia pinnata* | 4 | 2 | 0 | 8 | | | | | | |
| *Pista disjuncta* | 2 | 0 | 0 | 1 | 7 | | | | | |
| *Dentalium rectius* | 3 | 0 | 0 | 0 | 2 | 6 | | | | |
| *Heteromastus filobranchus* | 2 | 0 | 0 | 3 | 1 | 1 | 6 | | | |
| *Ancistrosyllis tentaculata* | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 5 | | |
| *Spiophanes fimbriatus* | 2 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 5 | |
| *Nothria iridescens* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |

Graph 5. Codominant frequency of most often occurring dominants in the submarine canyons. Single cumulative domination is shown for each species in each square at the right edge.

the remaining 31 samples are poor in diversity and total specimens, many being deep-water samples in which low diversity is to be expected. They might be assignable to the *Lysippe* zone if one were to accept the Thorson rule that only half of the samples of a community require the presence of a major dominant. Many are characterized by *Califia calida* and some by various species of *Aricidea.*

In five of the nine associations, *Pectinaria* is a major dominant, but whether those associations should be coalesced as a megacommunity or segregated is a matter for consideration when more exploration of the world's benthic communities and slope depths has occurred. The co-occurrence of *Pectinaria* with either *Capitella* or *Ancistrosyllis* results in high frequency values for *Pectinaria,* but its occurrence with *Dentalium* results in low values. Both *Pectinaria* and *Dentalium* live in hard conical tubes and *Pectinaria* may be affected either spatially or biologically by the presence of *Dentalium.*

The associations are not indelibly fixed, as Barnard and Ziesenhenne (1961) have pointed out in the gradation of the *Amphiodia* shelf-




Graph 6. Distribution with depth of important benthic organisms of submarine canyons, arranged approximately in depth sequences. Thickness of bar indicates frequency of the species. Solid bars represent the species in both insular and coastal canyons, hatched bars represent the species in insular canyons when they are not prominent in the coastal canyons.

community into *Onuphis* zones. *Capitella* often occurs with *Pectinaria*, but in other samples (see list in Table 6) it occurs in high frequency without *Pectinaria*. *Pectinaria* must be examined not so much from the shallow-water end of the spectrum, as from the deeper end. In the shallow-water *Amphiodia*-community, it forms a major subdominant and one might assume that it has migrated to the canyons from that locus. Because the continental slopes have been poorly studied, it is unknown whether *Pectinaria* indicates a "normal" community or whether it is an opportunistic dominant of unstable substrate. At first I had expected

| | | PECTINARIA | | | | | | | | | | | | | CHLOEIA | | | HETEROMASTUS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Haplo | Pectin. | | Dentalium | | | Capitella | | | Ancistrosyllis | | | | | | | | | | | | |
| | | 5114 | 7730 | 6897 | 4846 | 5661 | 7054 | 7043 | 7039 | 2190 | 5367 | 7030 | 3164 | 7284 | 5639 | 6909 | 7160 | 2148 | 2149 | 6903 | 5674 | 6499 | 5688 |
| Haploscoloplos | 5114 | ■ | | 40 | | | | | | | | | | | | | | | | | | | |
| Pectinaria | 7730 | 38 | ■ | | | 31 | | | 31 | | | 37 | | | | 34 | | | | | 19 | | |
| | 6897 | 37 | 44 | ■ | | | | | | | | | | | | | | | | | | | |
| Dentalium | 4846 | 20 | 26 | 14 | ■ | | | | | | | | | | | | | | | | | | |
| | 5661 | 28 | 46 | 63 | 23 | ■ | | | 21 | | | 26 | | | + Maldane | 24 | | | | | 15 | | |
| | 7054 | 19 | 34 | 26 | 42 | 39 | ■ | | | | | | | | | | | | | | | | |
| Capitella | 7043 | 24 | 27 | 29 | 8 | 26 | 21 | ■ | | 6 | | | | | | | | | | | | | |
| | 7039 | 27 | 34 | 46 | 8 | 45 | 16 | 79 | ■ | | | 28 | | | | 22 | | | | | 14 | | |
| | 2190 | 28 | 36 | 30 | 18 | 18 | 25 | 54 | 50 | ■ | | | | | | | | | | | | | |
| Ancistrosyllis | 5367 | 21 | 31 | 25 | 14 | 20 | 33 | 17 | 12 | 25 | ■ | | 57 | | | | | | | | | | |
| | 7030 | 31 | 44 | 41 | 14 | 38 | 24 | 26 | 36 | 26 | 37 | ■ | | | | 32 | | | | | 16 | | |
| | 3164 | 35 | 46 | 35 | 22 | 26 | 32 | 27 | 22 | 45 | 36 | 36 | ■ | | | | | | | | | | |
| | 7284 | 33 | 44 | 58 | 13 | 51 | 24 | 26 | 45 | 31 | 38 | 60 | 43 | ■ | | | | | | | | | |
| CHLOEIA | 5639 | 8 | 5 | 7 | 4 | 5 | 5 | 4 | 4 | 15 | 4 | 4 | 9 | 14 | ■ | | 34 | | | | | | |
| | 6909 | 21 | 20 | 25 | 13 | 17 | 30 | 18 | 16 | 33 | 26 | 20 | 24 | 27 | 29 | ■ | | | | | 22 | | |
| | 7160 | 36 | 40 | 27 | 24 | 27 | 20 | 25 | 22 | 38 | 17 | 25 | 33 | 34 | 30 | 43 | ■ | | | | | | |
| HETERO-MASTUS | 2148 | 16 | 20 | 14 | 27 | 2 | 10 | 17 | 14 | 46 | 9 | 11 | 31 | 18 | 11 | 16 | 30 | ■ | | | | | |
| | 2149 | 23 | 17 | 18 | 18 | 9 | 18 | 9 | 5 | 27 | 16 | 13 | 31 | 24 | 30 | 31 | 49 | 22 | ■ | | 27 | | |
| | 6903 | 22 | 17 | 11 | 24 | 10 | 11 | 4 | 1 | 12 | 15 | 7 | 17 | 3 | 7 | 10 | 29 | 34 | 20 | ■ | | | |
| | 5674 | 11 | 6 | 7 | 11 | 2 | 3 | 2 | 0 | 8 | 6 | 6 | 10 | 2 | 2 | 11 | 14 | 15 | 14 | 29 | ■ | | |
| | 6499 | 29 | 22 | 23 | 33 | 18 | 22 | 14 | 12 | 31 | 23 | 18 | 29 | 27 | 18 | 28 | 42 | 43 | 31 | 32 | 16 | ■ | |
| | 5688 | 3 | 10 | 4 | 24 | 1 | 4 | 1 | 1 | 8 | 8 | 4 | 10 | 3 | 1 | 3 | 17 | 30 | 13 | 30 | 12 | 47 | ■ |
| TOTALS EACH SAMPLE | | 510 | 607 | 584 | 400 | 514 | 458 | 458 | 495 | 604 | 433 | 524 | 599 | 618 | 216 | 461 | 622 | 436 | 438 | 345 | 187 | 558 | 234 |
| Maldane | 6497 | 1 | 5 | 3 | 8 | 8 | 12 | 2 | 1 | 7 | 5 | 5 | 6 | 1 | 58 | 12 | 4 | 4 | 8 | 14 | 14 | 8 | 2 |
| Lysippe | 6503 | 0 | 3 | 0 | 2 | 1 | 1 | 0 | 0 | 3 | 0 | 0 | 3 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 3 | 2 | 0 |

Graph 7. Representative samples of the submarine canyons with paired coefficients of association and their means summarized by blocks. Samples restricted to the *Pectinaria* and *Heteromastus* communities with their subassemblages and with comparisons to typical samples of the *Maldane* and *Lysippe* zones.

that canyon samples would reveal a haphazard occurrence of species indicating unstability of bottom, with each sample representing a different starting point in a myriad of successional regimes. This impression was entertained after observing the occurrence of *Listriolobus pelodes*, *Dorvillea articulata*, and various species of *Diopatra* in canyon samples in depths and in combinations with other species that were not normal for the coastal shelf. The strength of that expectation is not fully dissipated by the discovery of identifiable assemblages that indicate either a degree of stability in the substrate or a rapid repopulation of substrates after their consolidation.

Hartman (1955) presented partial analyses of numerous slope samples (50 - 300 fms) in which *Pectinaria* is often mentioned, but in which *Chloeia pinnata* is more abundant and with *Maldane* may represent the principal community dominant of the upper bathyal outside of canyons.

*Capitella capitata* has been suggested by Hartman (1963) as an indicator of undersea leakage from emergent sweet-water aquifers in canyons. It is tolerant not only of brackish waters but of polluted conditions in waters of normal salinity and may thus be an indicator of natural putrefaction. It lives in high densities in the inner harbor of Los Angeles in waters of normal salinity but low dissolved oxygen (see Reish, 1959 and Reish and Barnard, 1960). Its occurrence in some canyon samples may be related to high contents of organic matter in the sediments that are restrictive to other metazoans. *Capitella* appears to tolerate wide ranges of physical conditions that are restrictive to most organisms but apparently is seldom found with other animals. In the depth-sediment scheme (Graph 11), the *Capitella* samples are grouped in the coarse sediment range, indicating the presence of percolating water that must leak through coarse sediments. In bays and harbors *Capitella* inhabits fine-grained sediments (Reish, 1959).

## SAMPLE ASSOCIATIONS, METHODS

Despite their faults, trellis diagrams of association between pairs of samples, based on the percentage composition in each sample of each species, matching species in samples and summing the minimum percentages for an index of association, have been used to examine the interrelationships of canyon samples. Samples of low diversity more often match as pairs with high association indices than samples of low diversity matched with samples of high diversity. Thus, sample 4851 in Graph 8, with 66 species and 657 specimens, is a poor matching partner with 6779, having 18 species and 116 specimens. Both are dominated by *Maldane sarsi* and, indeed, 4851 has nearly twice as many specimens

MALDANE

| | 6497 | 6821 | 5639 | 3179 | 3178 | 2219 | 3399 | 3180 | 6779 | 7155 | 6850 | 4851 | 7729 | 7028 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6497 | | | | | | | | | | | | | | | |
| 6821 | 54 | | | | | | | | | | | | | | |
| 5639 | 60 | 52 | | | | | | | | | | | | | |
| 3179 | 53 | 51 | 56 | | | | | | | | | | | | |
| 3178 | 65 | 50 | 69 | 45 | | | | | | | | | | | |
| 2219 | 39 | 37 | 54 | 45 | 39 | | | | | | | | | | |
| 3399 | 49 | 42 | 36 | 37 | 46 | 37 | | | | | | | | | |
| 3180 | 42 | 41 | 28 | 56 | 31 | 31 | 33 | | | | | | | | |
| 6779 | 44 | 36 | 34 | 35 | 38 | 39 | 41 | 28 | | | | | | | |
| 7155 | 33 | 29 | 29 | 25 | 25 | 37 | 33 | 24 | 29 | | | | | | |
| 6850 | 26 | 30 | 22 | 22 | 24 | 25 | 26 | 25 | 24 | 22 | | | | | |
| 4851 | 23 | 26 | 21 | 28 | 16 | 22 | 13 | 27 | 14 | 21 | 16 | | | | |
| 7729 | 14 | 27 | 12 | 14 | 9 | 17 | 13 | 18 | 11 | 22 | 11 | 22 | | | |
| 7028 | 15 | 26 | 11 | 14 | 10 | 11 | 11 | 20 | 8 | 26 | 7 | 21 | 42 | | |
| | 517 | 501 | 484 | 481 | 467 | 433 | 417 | 404 | 381 | 355 | 280 | 270 | 232 | 222 | |
| 7730 | 4 | 13 | 5 | 5 | 2 | 11 | 4 | 7 | 2 | 12 | 4 | 9 | 49 | 35 | Pectinaria |
| 6503 | 2 | 2 | 0 | 3 | 3 | 6 | 7 | 6 | 1 | 1 | 3 | 1 | 1 | 2 | Lysippe |

LYSIPPE

| | 6503 | 2317 | 7050 | 6828 | 2336 | 7051 | |
|---|---|---|---|---|---|---|---|
| 6503 | | | | | | | |
| 2317 | 57 | | | | | | |
| 7050 | 32 | 19 | | | | | |
| 6828 | 20 | 17 | 29 | | | | |
| 2336 | 27 | 23 | 25 | 20 | | | |
| 7051 | 23 | 16 | 39 | 18 | 23 | | |
| | 159 | 132 | 144 | 104 | 118 | 119 | |
| 6820 | 3 | 2 | 3 | 7 | 5 | 4 | Anobothrus |
| 7043 | 0 | 3 | 3 | 1 | 0 | 2 | Pectinaria—Capitella |
| 4846 | 2 | 4 | 1 | 3 | 1 | 1 | Pectinaria—Dentalium |
| 5367 | 6 | 6 | 4 | 5 | 0 | 6 | Pectinaria—Ancistrosyllis |

Graph 8. Representative samples of the *Maldane* and *Lysippe* communities of submarine canyons with paired coefficients of association and comparison to typical samples of other communities.

of *Maldane* as 6779, but sample 4851 is swamped with so many specimens of other species that *Maldane* represents only 31.0% of the total specimens in the sample. This method does not consider that 4851 may be a climax sample with its full diversity whereas 6779 may be in an early stage of succession. Nor does it take into account that the *Maldane* community may be composed of numerous subcommunities, in a few samples of which (such as 4851) all the submembers are represented, whereas satellite samples may represent only minor members.

An alternate method may be used, viz.: in two samples to be compared the most diverse one is designated the "type," the less diverse, the "satellite"; percentage compositions of all species of the "satellite" are calculated; those same species in the type-sample also are extracted and percentage compositions calculated; then the two samples are compared by summation of minimum compositional percentages. Here the relationship of the satellite sample is compared to that portion of the type-sample that might be visualized as one of its subcommunal components. Such a comparison is made for 4851 as the type and 6779 as the satellite, both dominated by *Maldane*. The resultant index of association

is 47.7. The "standard" index of association computed by the conventional method is only 21.8 because of swamping of *Maldane* by other species in 4851.

Station 4851 is also compared with 5674, a sample dominated by *Heteromastus* and with a conventional index of association of 6.5. In the alternate method the index is 45.6, indicating the importance of *Nothria iridescens, Praxillella pacifica* and *Heteromastus* in both samples and suggesting the possibility that 4851 represents a bottom area on which the *Maldane* community and its associates are mixed with a *Nothria iridescens* subcommunity. Indeed, 4851 also has a significant number of *Pectinaria*, more specimens than in some other *Pectinaria*-dominated samples. There is no way to account for such mixed samples as 4851, or for species-impoverished samples such as 5674, or samples with impoverishment of the dominant species, except to assume that large sampling devices do collect closely contiguous but independent assemblages.

As a comparison, samples from the well-explored *Amphiodia urtica* community off southern California were interrelated using the trellis-presentation (Graph 9). Out of 67 samples, 20 were selected as having 180 or more specimens of *Amphiodia urtica* (extending from 180 to more than 600). Although some sample pairs had rather low indices of association, all were clearly dominated by *Amphiodia urtica*. As in the canyon samples, some *A. urtica* samples were swamped with numerous individuals of other species. In some cases a few species existed in high frequency and in other cases samples had nearly twice as many species with low numbers of specimens, but both reduced the prominence of the *Amphiodia* as a numerical dominant. Again, the overlaying of subcommunity matrices on the background of the basic community must be considered, for within the *Amphiodia* community may be seen numerous subcommunities that become prominent in certain samples, even though the basic *Amphiodia* structure is maintained. Indices of association extend from 24 to 75 with a median of 51. The principal dominants of the *Amphiodia* community are summed as to their percentage compositions in the left column of Graph 9, with a range of 27% to 81%. These samples are a good representation of the classical Petersen marine community (Thorson, 1957), but their strong variation permits wide latitude in the assignment of samples to a community nucleus. Those samples with highest coefficient interrelationships are also those samples generally having the most individuals of *Amphiodia* (Graph 9). Summation of the total coefficient values for each sample shows a range of nearly 50% of the highest value.

## AMPHIODIA URTICA COMMUNITY OF THE COASTAL SHELF

Coefficient rank decreasing →

| No. AMPHIODIA per sample | % DOMINANTS | STATION | 4859 | 4935 | 5092 | 5354 | 5370 | 4757 | 5108 | 4768 | 4924 | 4772 | 4878 | 5372 | 4920 | 4837 | 4871 | 5255 | 4835 | 5098 | 4785 | 4817 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 546 | 65 | *4859* | | | | | | | | | | | | | | | | | | | | |
| 510 | 74 | *4935* | 67 | | | | | | | | | | | | | | | | | | | |
| 648 | 80 | *5092* | 67 | 74 | | | | | | | | | | | | | | | | | | |
| 444 | 68 | *5354* | 65 | 63 | 65 | | | | | | | | | | | | | | | | | |
| 465 | 81 | *5370* | 70 | 72 | 75 | 64 | | | | | | | | | | | | | | | | |
| 436 | 63 | *4757* | 51 | 71 | 67 | 60 | 62 | | | | | | | | | | | | | | | |
| 383 | 66 | *5108* | 67 | 72 | 66 | 64 | 70 | 63 | | | | | | | | | | | | | | |
| 420 | 57 | *4768* | 51 | 60 | 62 | 65 | 60 | 63 | 60 | | | | | | | | | | | | | |
| 356 | 63 | *4924* | 62 | 68 | 61 | 65 | 61 | 61 | 63 | 60 | | | | | | | | | | | | |
| 297 | 69 | *4772* | 46 | 69 | 69 | 59 | 69 | 65 | 65 | 63 | 62 | | | | | | | | | | | |
| 252 | 69 | *4878* | 64 | 62 | 65 | 65 | 65 | 61 | 62 | 62 | 59 | 63 | | | | | | | | | | |
| 203 | 59 | *5372* | 62 | 61 | 60 | 64 | 63 | 58 | 67 | 58 | 60 | 57 | 66 | | | | | | | | | |
| 389 | 68 | *4920* | 62 | 68 | 71 | 59 | 69 | 56 | 64 | 54 | 65 | 65 | 56 | 57 | | | | | | | | |
| 285 | 59 | *4837* | 50 | 52 | 51 | 57 | 48 | 51 | 47 | 51 | 55 | 46 | 46 | 46 | 48 | | | | | | | |
| 240 | 50 | *4871* | 54 | 52 | 47 | 52 | 50 | 48 | 55 | 54 | 53 | 48 | 52 | 52 | 43 | 46 | | | | | | |
| 337 | 50 | *5255* | 54 | 47 | 47 | 51 | 41 | 53 | 41 | 49 | 50 | 41 | 42 | 39 | 43 | 58 | 42 | | | | | |
| 315 | 40 | *4835* | 46 | 41 | 44 | 50 | 45 | 47 | 40 | 45 | 43 | 41 | 44 | 42 | 37 | 46 | 39 | 54 | | | | |
| 274 | 45 | *5098* | 45 | 43 | 42 | 47 | 40 | 44 | 41 | 46 | 42 | 41 | 43 | 38 | 35 | 43 | 44 | 49 | 47 | | | |
| 191 | 29 | *4785* | 32 | 31 | 27 | 38 | 30 | 35 | 33 | 37 | 30 | 25 | 34 | 33 | 25 | 32 | 36 | 43 | 40 | 37 | | |
| 188 | 27 | *4817* | 43 | 30 | 29 | 33 | 29 | 39 | 29 | 37 | 31 | 24 | 28 | 33 | 28 | 43 | 31 | 39 | 36 | 35 | 41 | |
| TOTALS of Coefficients for each sample | | | 1125 | 1103 | 1089 | 1086 | 1083 | 1076 | 1069 | 1055 | 1051 | 1040 | 1039 | 1016 | 1005 | 916 | 898 | 883 | 829 | 802 | 650 | 631 |

*MEDIAN COEFFICIENT = 51*
*RANGE 24—75*
*DOMINANTS:*
*Amphiodia urtica*
*Amphiodia squamata*
*Pectinaria californiensis*
*Pholoe glabra*
*Paraphoxus bicuspidatus*
*Paraphoxus similis*

Graph 9. The *Amphiodia urtica* community of the shelf of southern California, represented by 20 of the samples having the dominant most abundant, with paired coefficients of association and totals for each sample.

Another example is the *Listriolobus* community (Barnard and Hartman, 1959) of which 12 samples chosen for their extreme variability are presented in Graph 10. Contrary to the *Amphiodia* community in which dominance of *Amphiodia* in standing crop is also reflected in the high frequency of individuals, the *Listriolobus* community is dominated by a low number of individuals having a heavy bodyweight. *Listriolobus* ranges in frequency from 1% to 8% of the specimens in a sample. A type-sample is 5419 in which *Listriolobus* represents 8% of the specimens, *Ceratocephala* sp. (a specifically characteristic species) 9%, *Saxicavella* sp. (another indicator species) 16%, *Callianassa* sp.

**LISTRIOLOBUS COMMUNITY of the Coastal Shelf**

Coefficient rank decreasing ⟶

| | 5419 | 5414 | 5400 | 5413 | 5262 | 5404 | 5410 | 5330 | 5261 | 5166 | 4826 | 5421 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5419 | ■ | | | | | | | | | | | |
| 5414 | 40 | ■ | | | | | | | | | | |
| 5400 | 62 | 40 | ■ | | | | | | | | | |
| 5413 | 38 | 64 | 35 | ■ | | | | | | | | |
| 5262 | 43 | 29 | 37 | 30 | ■ | | | | | | | |
| 5404 | 58 | 34 | 49 | 30 | 30 | ■ | | | | | | |
| 5410 | 39 | 32 | 34 | 34 | 39 | 32 | ■ | | | | | |
| 5330 | 29 | 32 | 27 | 31 | 32 | 27 | 38 | ■ | | | | |
| 5261 | 32 | 28 | 32 | 25 | 48 | 24 | 31 | 36 | ■ | | | |
| 5166 | 31 | 27 | 31 | 25 | 27 | 29 | 28 | 36 | 33 | ■ | | |
| 4826 | 24 | 38 | 26 | 39 | 27 | 20 | 23 | 28 | 25 | 25 | ■ | |
| 5421 | 20 | 36 | 25 | 34 | 16 | 21 | 17 | 27 | 16 | 24 | 26 | ■ |

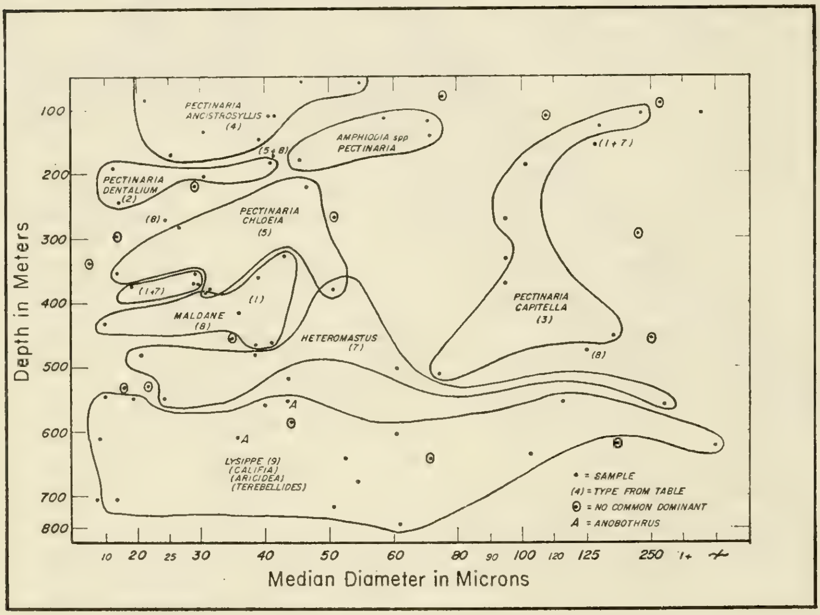
Median coefficient = 32
Range 16—64

**% OF FAUNA IN EACH SAMPLE RANKED**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Heterophoxus* | 9 | 9 | 12 | 7 | 8 | 11 | 6 | 3 | 3 | 3 | 1 | 2 |
| *Amphiodia* | 2 | 9 | 2 | 8 | 4 | 2 | 16 | 14 | 4 | 3 | 4 | 2 |
| *Ceratocephala* | 9 | 20 | 7 | 13 | 0 | 1 | 0 | 0 | 2 | 0 | 6 | 3 |
| *Listriolobus* | 8 | 2 | 6 | 2 | 5 | 7 | 8 | 2 | 2 | 3 | 4 | 1 |
| *Saxicavella* | 16 | 3 | 8 | 3 | 1 | 11 | 2 | 0 | 0 | 1 | 1 | 1 |
| *Callianassa* | 4 | 0 | 1 | 1 | 10 | 2 | 6 | 5 | 12 | 5 | 0 | 0 |
| *Phoronopsis* | 14 | 1 | 6 | 0 | 2 | 5 | 2 | 3 | 2 | 0 | 0 | 0 |
| *Terebellides* | 1 | 1 | 3 | 1 | 4 | 2 | 5 | 1 | 3 | 3 | 3 | 1 |
| *Listriella goleta* | 4 | 2 | 1 | 2 | 7 | 2 | 2 | 2 | 3 | 1 | 0 | 0 |
| *Axinopsis* | 1 | 2 | 2 | 1 | 1 | 2 | 0 | 5 | 0 | 2 | 3 | 5 |
| *Pectinaria* | 1 | 3 | 1 | 4 | 2 | 3 | 3 | 0 | 0 | 1 | 1 | 3 |
| *Sternaspis* | 1 | 0 | 0 | 3 | 4 | 0 | 2 | 2 | 2 | 0 | 3 | 1 |
| *Marphysa* | 1 | 0 | 5 | 0 | 0 | 1 | 0 | 1 | 4 | 2 | 0 | 0 |
| *Poecilochaetus* | 4 | 0 | 3 | 0 | 2 | 0 | 0 | 1 | 2 | 0 | 0 | 0 |
| *Pinnixa* | 0 | 0 | 2 | 0 | 2 | 0 | 1 | 0 | 3 | 2 | 0 | 1 |
| TOTALS | 75 | 52 | 59 | 45 | 51 | 49 | 53 | 39 | 40 | 23 | 26 | 20 |

Graph 10. The *Listriolobus* community of the shelf of southern California, represented by 12 samples selected for their spectral range between greatest extremes, with paired coefficients of association above and the percent of specimens of dominants in each sample below.

(a genus nearly restricted to the *Listriolobus* bed on the coastal shelf) 4%, *Phoronopsis* sp. (another characteristic, nearly exclusively limited species) 14%. These taxa, plus others shared with adjacent communities, such as *Amphiodia* and *Pectinaria,* comprise 75% of the specimens in the sample (Graph 10). Unlike the *Amphiodia* community, in which only 6 species regularly comprise more than 50% of the specimens (owing to predominance of *Amphiodia*), the *Listriolobus* community commonly requires tabulation of 14 species to comprise 50% of the specimens of a sample. The samples in Graph 10 show the extremes of variability, whereas the heart of the community, represented by about 20 samples not shown, is more typical of sample 5419.




Graph 11. Depth-sediment partitioning of community assemblages of submarine canyons based on those samples analyzed for median diameters and those fitting the schematic dominations of graphs 7 and 8.

## THE CANYON ASSOCIATIONS

Selected canyon samples are prearranged in the trellis diagram of Graph 7, and extend from "typical" samples dominated by *Pectinaria* alone, to *Pectinaria* with *Dentalium*, *Pectinaria* with *Capitella*, *Pectinaria* with *Ancistrosyllis*, then with *Chloeia*, and one with *Ancistrosyllis-Chloeia-Maldane* together; on the right are samples dominated by

*Heteromastus*, those to the middle having *Chloeia* as a subdominant and thus overlapping the *Pectinaria-Chloeia* bundle. Only a few of the intercomparable values exceed 50, in contrast to the *Amphiodia* trellis diagram, but resembling the *Listriolobus* diagram. Summation of the coefficient values gives a range from 187 to 622. Those samples with *Pectinaria* as a dominant have a range of 400 to 622 (excluding station 5639, a *Maldane* sample included for its high count of *Pectinaria*). The *Heteromastus* samples range from 187 to 622 also (including station 7160, a mixture of *Pectinaria* and *Heteromastus*). Except for station 5674, a sample poor in diversity and abundance of specimens, the *Heteromastus* samples are scarcely less well related to the *Pectinaria* side than are some of the marginal samples of the *Listriolobus* community among themselves. *Heteromastus* is especially connected to *Pectinaria* through those samples sharing *Chloeia* as a principal subdominant. *Heteromastus* samples are related more to *Pectinaria*-bottoms than are *Maldane* samples, as evidenced by the best *Maldane* sample (6497) being compared with other samples in Graph 8. A *Lysippe* sample also is compared. Despite the spectral arrangement of the samples, with no clear break between various community appellations and despite the overlap of dominations, especially in those samples such as 5639 where several of the dominant species exist together, the arrangement, as seen in Table 6, indicates a discrete *Maldane* community; a "*Lysippe*" community that represents deepwater; and a *Heteromastus* assemblage that probably is a major subdivision of the widely-occurring *Pectinaria* community. The *Pectinaria* community has numerous variants in which several subdominants alternatively occur. The unity of the samples is also shown by the codominance of both *Pectinaria* and *Heteromastus* in stations 7032 and 3166 and both *Pectinaria* and *Maldane* in 6819 (as well as examples shown in Graph 8).

Without sufficient sedimentary data (only 55 of the canyon samples were analyzed for sediments), it is possible only to suggest that the *Pectinaria* subcommunities may be controlled by sediments and depth together. In Graph 11 those samples of Table 6 that have been clearly assigned to communities and that have been analyzed for sediments are delimited into community groups. A clear-cut depth partitionment is shown of *Ancistrosyllis*, followed by *Dentalium*, then *Chloeia*, then *Maldane* (less clearly), and *Heteromastus* within the finer-grained sediments. On the coarse side, *Pectinaria* and *Capitella* dominate. In deeper waters are grouped the amalgamated *Lysippe* samples. The overlap of communities is shown in the group of samples denoted by "1 & 7" that are *Pectinaria* mixed with *Heteromastus* and by a codominant

sample belonging to both *Maldane* and *Pectinaria-Chloeia* types, another overlap being shown between *Heteromastus* and *Pectinaria-Chloeia.*

## THE BORDERLAND BASINS

The borderland of southern California has 13 enclosed basins (Hartman and Barnard, 1958, 1960; Emery, 1960), in which 165 benthic biological samples have been obtained, nearly half of which were collected in San Pedro Basin (Table 7). Hartman and Barnard have already discussed the fauna of these basins, but at that time a number of the amphipods had not been identified.

Subsill waters of the nearshore basins of Santa Barbara, Santa Monica and San Pedro have very low dissolved oxygen values (0.2-0.3 ml/L) and the faunas are impoverished, the number of amphipods averaging only $1.5/m^2$. In the deeper offshore basins the oxygen values are higher (0.4-2.0 ml/L) and the number of amphipods per square meter is 6.0, but the small number of samples and low density does not permit assessment of more than a fraction of the probable amphipod fauna. It will be necessary to utilize benthic trawls with fine-mesh nets to collect all of the very rare species before a complete knowledge of the fauna is reached. Nevertheless, the present samples give us valuable indications of the kinds of abundant species (Table 8).

The basins support 28 identifiable species and a number of others (Appendix II) that have not been identified because of fragmentation of specimens. Only 7 of the 28 species are unique, so far, to the basins (Table 9), the remainder having been found above sill depths, primarily in the submarine canyons (because most slope sampling has been done in that environment).

The shallowest basins (San Pedro, Santa Monica, Santa Barbara), with low dissolved oxygen and low densities of animals, support a rather large proportion of eurybathic organisms. Of the 9 species of amphipods, 5 are primarily deep sublittoral species: *Ampelisca pugetica*, *A. macrocephala*, *Heterophoxus oculatus*, *Monoculodes norvegicus* and *Urothoe varvarini*. *Heterophoxus oculatus* is truly a eurybathic organism and the others are of cold-temperate occurrence. The remaining four species are among the most abundant in the canyons: *Ampelisca coeca*, *Harpiniopsis epistomata*, *Liljeborgia cota* and *Byblis barbarensis*.

The next group, Santa Catalina, Santa Cruz, San Nicolas and Tanner Basins, supports only *Heterophoxus oculatus* and *Urothoe varvarini* of the deep sublittoral group, but the deep sublittoral and shallow bath-

yal *Nicippe tumida* is a member of the fauna. Several other cold-water sublittoral species, such as *Paraphoxus oculatus*, *Leptophoxus falcatus*, *Ampelisca eoa* and *Sophrosyne robertsoni* are present also, these species not being found in the warm-temperate sublittoral of southern California. *Pardaliscella symmetrica*, an upper slope species, is found in San Nicolas Basin.

The remaining deeper basins have less biotic diversity but also support *Heterophoxus oculatus*. San Clemente Basin has a member of *Lepidepecreella,* heretofore considered a littoral cold-water genus, and strangely enough, *Phoxocephalus homilis*, a deep sublittoral warm-temperate species, has been found there.

More intensive sampling, no doubt, will reveal additional deep sublittoral species that stray into the basins, but these should be offset by an increased recovery of rare (low frequencies of individuals), optimally bathyal species. The straying of sublittoral and shallow bathyal taxa into the basins probably would not occur were the basins located far offshore.

## THE AMPHIPODA

### Frequency of Amphipoda in Basin and Canyons

The frequency of Amphipoda in the shallow-water canyon heads is scarcely less than that on the coastal shelf (compare densities at 100 m for shelf and canyon in Table 10), perhaps indicating the unstable substratum, but also perhaps denoting errors because of the difficulty of obtaining samples in canyons. The grabbing device may hit steep slopes in the narrow canyon heads during or after sampling and small crustaceans may be lost in the recovery. Fast-moving demersal species may sense and escape the descending grab. The substratum in the shallow heads is sandy and the density of organisms is known to decrease on sandy bottoms, as shown by Barnard (1963), although the figure of 257 individuals/m$^2$ in the inshore sands in depths of less than 10 m is roughly half that in the canyon heads on substrata in less than 100 m of depth.

The frequency of Amphipoda declines erratically with depth in the canyons, indicating the need for consideration of many more samples to eliminate not only sampling error, but to equate the variations of sediments and other environmental factors. Nevertheless, four provinces of density appear in the data in these depths: (1) between 0 and 100 m, where the average density is 588 individuals/m$^2$, (2) between 101 and 500 m, where the density is 54/m$^2$, (3) between 501 and 1000 m, where the density is 14.7 individuals/m$^2$, and (4) between 1001 and 1600 m, where the density is 2.8 individuals/m$^2$.

The seaward, deeper ends of many of the canyons debouch onto basin floors, especially the biotically impoverished shoreward basins of Santa Barbara, Santa Monica and San Pedro. The frequency of Amphipoda drops to 1.5 individuals/m$^2$ below sill depths, although the slopes and canyon fans above sill depths (475 to 737 m) support between 7 and 21 (or as many as 43) individuals/m$^2$. Canyon floors well below sill depths, that empty onto trough floors or onto deeper basins, continue to support 11 individuals/m$^2$. The deeper outer basins (numbers 4-12 in Table 7) support 6 individuals/m$^2$, but apparently these basins, although having sill depths well below oxygen minimum layers, have depleted biotic frequencies, because two samples on the Patton escarpment above sill depths have an average of 20 individuals/m$^2$. Unfortunately, no samples from nonbasin areas of the deep borderland, except on the slopes of San Pedro, Santa Monica and Santa Barbara basins, have been taken so that these values can not be confirmed.

## Diversity and Dominance of Amphipoda in the Canyons

About 185 species of Amphipoda occur on the coastal shelf of southern California in water depths of 5 to 183 m, according to my records and a manuscript in preparation. The intertidal has not been assessed.

The most abundant amphipod species on the coastal shelf are shown in Table 11, the most abundant in depths of 92-183 m in Table 12 and the most abundant in depths of 4-10 m in Table 13. Amphipoda of the shallowest 100 m of the canyons (Table 14) are a mixture of species from the above zones. The first two taxa of Table 14, *Aoroides* and *Parapleustes*, are phycophilous, the former probably building tubes attached to algae, surf-grass and plant debris. These are unusually high rankings for both species, as the latter is almost exclusively an intertidal form. The remaining species of the canyon heads comprise a high number (9 out of 16) of the common shelf species, as marked with asterisks in Table 14. The high rank of *Ischyrocerus pelagops* is another indication of the predomination of plants and/or plant debris on substrates of canyon heads. Little relationship is shown to the upper slope fauna (Table 12) except for the presence of *Protomedeia articulata*, a species that is not necessarily characteristic of slope faunas because it occurs also in moderate shelf depths on silty bottoms.

Conspicuously absent from the list of important canyon-head Amphipoda is *Paraphoxus bicuspidatus*, the most abundant shelf and slope amphipod.

In depths of 101-200 m, the canyon fauna compares most favorably with that on the upper coastal slopes, 92-183 m (see Tables 12 and 15).

Eleven of the 15 important canyon species are in the abundancy list from the slope. Here *Paraphoxus bicuspidatus* occurs in its expected high density.

The most common amphipods in each depth interval in the canyons are shown in Table 16. The most important is the eurybathic *Heterophoxus oculatus*, occurring from the shallow shelf through most of the depth range that has been sampled. *Ampelisca macrocephala* exists as an oculate subspecies in depths shallower than 300 m, becoming largely the blind subspecies *unsocalae* in greater depths. Deep-water influence starts at 301 m with harpinias commencing to predominate. *Protomedeia articulata* and *Paraphoxus daboius*, in depths of 701-1000 m, are enclosed in parentheses to indicate that the former species is restricted largely to Monterey Canyon and that the latter species represents a possible abnormal depth displacement. Indeed, *Paraphoxus obtusidens* in 401-500 m is abnormally displaced, but *P. calcaratus* is truly a cold-water form not found in shallow waters of southern California. The families Phoxocephalidae and Ampeliscidae predominate; they are burrowing and tube-dwelling organisms dominating most open-sea sublittoral and bathyal substrates.

The occurrence of *Maera simile* in depths of 201-300 m is an unusual record of a primarily eulittoral phycophilous organism.

A partially subjective assessment of the optimal environment of the taxa has been made in order to place each canyon species in the scheme of Table 17, showing the decline of shelf species and the increase of slope species in relation to depth intervals in the canyons. Between 400 and 600 m the faunal balance is shifted from its primarily sublittoral character to its primarily bathyal condition.

Some species that have been assigned to the shelf fauna occur primarily on its deeper margin. Many of those listed below live in shallow waters in colder latitudes and have been displaced to the shelf edge in southern California, but do not descend far into the slope environment: *Monoculodes norvegicus*, *Orchomene pacifica*, *Ericthonius hunteri*, *Haploops spinosa* and probably all of those species listed in Table 18 between *Bathymedon roquedo* and *Monoculodes norvegicus*.

## Ascent and Descent of Species in the Canyons and Basins

That canyons cutting the full width of the shelf might afford pathways for shelf animals descending to greater depths than normal was suggested when the spoon-worm *Listriolobus pelodes* (see Barnard and

Hartman, 1959) was brought up in a deepwater sample in Hueneme Canyon (177 m). The distribution of this species had been rather thoroughly investigated, and it was known to be replaced on the upper coastal slope by other genera of spoon-worms. Because *Listriolobus* lives on sediments that are very finely particulate for the coastal shelf, its perimeter is limited to a small area of silt on the Santa Barbara coastal platform. Other areas of suitable sedimentary texture for *Listriolobus* would lie somewhere on the low-gradient fans at the base of the coastal slope and canyons; these presumably would be in waters too deep for *Listriolobus.*

Continental slopes have been poorly studied, although Emery and Terry (1956) reported on a slope sediment with a median diameter of $22\mu$, approximately the same as that found in the *Listriolobus* beds. But presumably the average slope sediment is coarser than the average outer shelf sediment (75-100 m), hence restricting *Listriolobus.* The sediments of submarine canyons are patchy and extend from black muds bearing coarse organic matter to coarse sands pouring down the canyon heads; but generally as the gradient decreases the sediments become finer and merge with basin or trough muds and clays. Some canyon bottoms support sediments of extremely high organic content, producing hydrogen sulfide and methane.

The find of *Listriolobus* in Hueneme Canyon indicated that some shelf species descend to greater than normal depths wherever suitable sedimentary texture exists. Perhaps other species descend regardless of texture; they may be dependent on factors such as the availability of organic matter. The two variables, grain size and organic content, are usually complementary but the supply of organic matter to patches of fine sediment trapped on the coastal slope far from shore may be too low to support feeding by various organisms. Some species may ignore the steep thermal inclines in favor of adequate food supplies or absence of competition.

The lack of slope biological samples hinders the detection of other shelf species that descend only down canyons, but presumably a number of taxa listed in Table 19 have descended to greater than normal depths in the canyons. Their maximum depths (within 10 m) on the coastal shelf are based on 348 samples. Some marked with asterisks are known to be associated with algae and may have been rafted down the canyon slopes. Insular shelves and slopes of the offshore islands have not been adequately sampled but a few samples from those places revealed species living at greater depths than on the mainland shelf, ap-

parently because the offshore waters are more transparent and algae live at greater depths than on the mainland shelf. Hence, the descent of the species indicated in Table 19 may have other causes than factors associated with a canyon environment.

The ascent of bathyal species along canyon pathways cannot be determined because of sparse data on their occurrence in normal environments of the slope. The shallowest known member of the bathyal fauna is *Harpiniopsis fulgens*, recorded at 128 m but extending to depths of 2000 m. This great eurybathicity suggests, however, the probability that the species normally occurs in shallow depths. Other harpinias do not occur in depths shallower than 300 m. The deep-sea species of *Ampelisca*, *Byblis*, *Liljeborgia* and *Leptophoxus* do not ascend to depths shallower than 400 m in these latitudes.

Amphipod ecologists must note the unusual association of *Ampelisca lobata* and *Paraphoxus abronius* with plants, the former being especially associated with intertidal surfgrass, perhaps inhabiting the interstices at the root level, and the latter almost always being associated with samples bearing masses of red algae (whether or not attached to the substratum is not known).

The genus *Listriella* represents an interesting case that is linked to the *Listriolobus* situation. Mills (1962b) has published evidence that a species of *Listriella* on the Atlantic coast of America is a commensal with polychaetes, especially maldanids. In southern California *Listriella* is particularly associated with the *Listriolobus* community wherein maldanid polychaetes also are predominant. Three of the five species, *Listriella albina*, *L. goleta* and *L. eriopisa*, are confined primarily to fine-silt beds bearing *Listriolobus* and each species declines in frequency toward the edge of the coastal shelf, but is rather prominent in canyon samples. *Listriella albina* notably has a second area of maximum density in the canyons in depths of 300 to 400 m (Table 20). Host-specific association between most listriellas and maldanids is not apparent in data of either canyons or the *Listriolobus* bed, although *Listriella albina* is strongly associated with *Maldane sarsi*. Generally, samples containing any maldanids have several genera and species. At least 18 species of maldanids in 13 genera have been recovered in the canyons and two or more species of *Listriella* usually occur in maldanid samples. Occasionally samples having *Listriella* do not have maldanids. A single maldanid, *Axiothella rubrocincta* (see Barnard, 1964 and Reish, 1963), inhabits Bahía de San Quintín but it is not associated with

*Listriella melanica.* On the other hand, the amphipod is strongly correlated* with *Pista alta* (Terebellidae), suggesting that listriellas may also live in association with polychaetes of families other than Maldanidae.

## Depth Distribution of the Amphipoda in the Canyons and Basins

The known depth distributions of those species collected in the submarine canyons and basins have been arranged in Table 18. Extreme depths and mid-depths are quoted. The species are arranged in groups depending on their occurrence in shallowest water depth and in each group according to their greatest depth penetration.

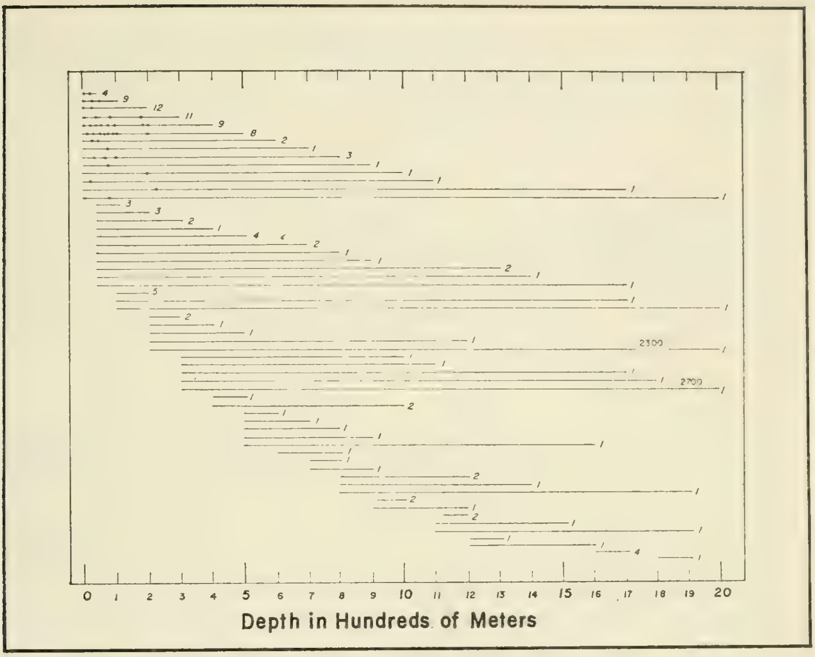
Only four species are restricted to water of less than 30 m in depth. The next group of species has minimum depths of less than 20 m, but occurs from 82 to 1941 m in maximum depth. There follows a group of species with minimum ranges of 21-100 m and then progressively groups of species with minimum depth extremes of 100, 200, 300, 400 m, etc.

The largest group of species has its minimum depths between 0 and 20 m, but there is a surprisingly high percentage of the taxa demonstrating rather strong penetration to greater depths. Of the 64 species (Graph 12 and Table 21) occurring in waters of 0-40 m, only 13 are restricted to depths shallower than 100 m and 11 extend to depths exceeding 500 m. A similar situation occurs in that group of species having minimum depths between 40 and 100 m (Graph 12). Only 3 of the 21 species are confined to waters of less than 100 m and 8 occur in depths greater than 500 m.

Knowledge of the bathymetric ranges of species confined to depths exceeding 300 m is more imperfect than of those known from less, because the distributions of the shallow water species are based on more than 400 shelf and upper slope samples that supplement the samples taken from the canyons and basins.

Potentially, almost all of the coastal shelf species known in depths of 200 m or less might be found in the submarine canyons, at least in their shoreward parts. In this study, 92 species having depth ranges of 0-200 m on the shelf have been collected in the canyons, although 185 species are known to occur on the shelf in those depths. The density of sampling in the canyons has not approached that on the shelf, and probably

*$r = 0.432534$, $N = 91$.




Graph 12. Extremes of known depth distribution of amphipod species collected in the submarine canyons and basins. Each bar represents a species or a group of species having similar depth ranges. In depths greater than 100 m the ranges are classed to the nearest 100 m. Shallower than 100 m the species are grouped in classes of 0 and 40 m. For instance, the first bar shows four species having depth ranges limited to 0-40 m. Bar 3 shows 12 species having ranges of 0-200 m. Bar 16 shows three species having depth ranges between 40 and 200 m.

On the bars near the top of the graph are dots representing the depths at which the species have their highest densities. Bar 6 shows 8 dots, each representing the highest density for each of the 8 species having that depth range. On bars 1-5 most of the species have their densest populations in 0-10 m and a single dot represents those species. Thus, in bar 2, with 9 species, only 2 have their highest densities in depths exceeding 10 m. Insufficient data are available for species below bar 14.

25 of the 185 known shelf species are associated with subtidal algae. These amphipods may be carried into the heads of canyons only in association with detached algae.

## Comparison of the Faunal Composition of Canyons and Basins With That of the World Bathyal Zone

Although bathyal depths have been defined as exceeding 200 m (Hedgpeth, 1957), I have used in the following treatment the depth of

300 m in order to exclude a large number of sublittoral species recorded sparsely from depths of 200-300 m. That depth is believed to be more significant for the upper limit of the bathyal fauna in the mid-latitude submarine canyons than is the 200 m depth, for at 300 m the first truly bathyal taxa, the harpinias, are found.

The broader distribution of Amphipoda in the Pacific Ocean outside of southern California is poorly known. Only a few of the littoral and bathyal species that have been reported upon by Gurjanova (1938, 1951, 1952, 1953, 1955, 1962) from the northwestern Pacific, the Japan Sea, Okhotsk Sea and Bering Sea have been discovered in southern California, but a significant proportion of these occur in the north-eastern Atlantic (Table 22).

As shallow water species are of no concern to this discussion, it commences with those species of Table 22 having median depths of 266 m or more. *Westwoodilla caecula* forma *acutifrons* (266 m) and the typical form represent the only members of this diverse boreal genus occurring as far south as southern California. The closely related, if not synonymous, genus *Bathymedon* is diversified in southern California, but none of the known boreal species has been found there. Another oedicerotid genus, *Monoculodes*, has the species *M. latissimanus* and *M. norvegicus* present in southern California, but none of the other numerous boreal species is known to occur that far south, even in bathyal depths.

Of the three species of boreal *Bruzelia*, only one, *B. tuberculata*, extends to southern California, although one new species is described and other new species are believed to occur in Cedros Trench material being studied at this time.

*Paraphoxus oculatus*, the only species of that enormously diverse genus living in the northeastern Atlantic, occurs also in the Pacific Ocean. It submerges toward the tropics. In southern California waters its minimum recorded depth is 239 m. Except for *Paraphoxus calcaratus* and the reports herein of *P. daboius*, *P. abronius*, *P. obtusidens* and *P. spinosus*, all appearing to be abnormally displaced bathymetrically, *Paraphoxus oculatus* is the deepest dwelling member of the 44 species in the genus. Its wide range and eurybathicity may be connected with its presumed penetration from the Pacific to the northeastern Atlantic Ocean (see remarks by J. L. Barnard, 1958a); otherwise, *Paraphoxus* is confined to the western Atlantic and Indo-Pacific Oceans.

*Paraphoxus calcaratus* is a shallow-water member of the northwestern Pacific fauna that submerges tropicwards in southern California, as,

unlike the other Californian species of *Paraphoxus*, it rarely occurs in shallow waters, having its minimum depth at 75 m.

A subspecies, possibly an ecotype of the deepwater north Atlantic *Leptophoxus falcatus*, is a relatively important member of the bathyal southern Californian amphipod fauna.

*Urothoe varvarini*, an haustoriid, is eurybathic in southern California, occurring between 31 and 1292 m, and members of its deeper populations are blind. Its distribution resembles that of its close relative, *U. elegans*, a species found between 0 and 3100 m in the Atlantic Ocean but submerging towards the tropics.

Several circumboreal species occur in southern California: *Hippomedon denticulatus*, *Ampelisca macrocephala*, and those already discussed — *Westwoodilla c. acutifrons*, *Bruzelia tuberculata, Paraphoxus oculatus*, and *Leptophoxus falcatus.* Possibly, with the records here obtained, one must also consider *Haploops spinosa* and *Sophrosyne robertsoni* as circumboreal. Cosmopolitan (or bipolar) species include *Argissa hamatipes* and possibly *Nicippe tumida*, both of which are eurybathic. The second record herein of *Sophrosyne robertsoni* in 70 years is an indication not only of the need for more sampling in the bathyal, but also of the rarity of the species or its concealment in a special habitat that is sampled only by accident.

*Ampelisca eoa* is a shallow-water, north Pacific species submerging tropicwards in southern California, where its minimum depth is 210 m. *Ampelisca furcigera* is a deepwater north Pacific species extending southward as far as southern California at relatively similar depths in the bathyal.

By excluding eurybathic species and any known to occur in depths of less than 100 m, one tallies 47 species of bathyal amphipods from southern California (Table 18), of which 8 have been reported outside of the northeastern Pacific. This sparse occurrence of extrinsic members of the fauna is artificial, for bathyal explorations in other parts of the Pacific are few.

The systematic relationship of the bathyal fauna to the local sublittoral fauna appears to be rather low. Indeed, many of the genera are different (Table 23). Only 9 of 27 genera are sublittoral in character, the remaining 18 genera occurring only in the bathyal. Of course, many of the "bathyal" genera exist in the sublittoral of the cold-temperate zone. Twenty-nine of the bathyal species belong to bathyal genera, and 17 belong to sublittoral genera. I find no evidence of close morphological

relationship to local sublittoral species for any of the 17 bathyal species belonging to littoral genera. This statement needs qualification by stating the inability, at present, to trace relationships in such diverse genera as *Ampelisca* and *Byblis*, especially the latter in which interspecific differences are minor. Except for *Ampelisca* and *Paraphoxus* and possibly *Metopa*, the other so-called sublittoral genera are poorly represented on the southern Californian coastal shelf and indeed are more diverse in the boreal. The boreal orientation of the bathyal fauna of southern California is seen especially in the genera *Protomedeia*, *Monoculodes*, *Liljeborgia*, *Tryphosa*, *Schisturella*, *Bruzelia, Leptophoxus, Proboloides, Bathymedon*, *Sophrosyne*, and *Lepidepecreella.* However, some of these genera also are well represented in the antiboreal, such as *Liljeborgia*, *Tryphosa*, *Proboloides* (subgenus *Metopoides*), and *Lepidepecreella. Paroediceroides* also has an antiboreal attitude, but one must question whether it is distinct from *Monoculodes. Thrombasia*, *Tosilus* and *Coxophoxus* are newly erected and their further distribution is unknown. The single species placed in *Melphidippa* is questionably assigned.

## PROSPECTUS

Future studies on canyons might include the following:

1. Concentration of study on one canyon in greater detail than attempted in this survey.

2. Microtopography: use of undersea vehicles and focused-beam bathymetric sounding to chart microrelief of canyons (Buffington, 1964) in detecting areas for sampling of sediments and life. Presumably, the canyon axis has flat areas where fine sediments are trapped and organic content is therefore high; perhaps these are places in which coarse organic debris reaches stabilization after saltation.

3. Establishment of several semi-permanent undersea stations equipped with television for observation of sedimentary movements and biotic activities. A platform or observation chamber equipped with television, current meters, salinometers, thermistors, sediment traps and other devices could be submerged into fixed position with the aid of a diving vehicle; recording devices might be self-contained or connected by cable to a shore station (several California laboratories are situated close to favorable study areas).

4. The study of currents is of first importance; perhaps the fixed benthic recording station could be equipped with a buoy suspended above it, to the cable of which are attached recording current meters at inter-

vals. Thus, benthic currents as well as areas of upwelling might be detected simultaneously. Epibenthic current meters would have to be paired to detect both horizontal and vertical motion.

5. A series of sediment traps at substrate level and above should be used to collect sediments for studies of depositional rates and accretion of organic matter. Traps might be attached to long flexible arms so that they could be positioned remotely adjacent to canyon walls or at the bases of declivities, on benches and in "plunge pools." Large deep tubs of sediments devoid of metazoan life might be established and monitored for biotic succession. The seasonal variability and origin of settling larvae could be determined simultaneously. A series of standards might be developed that would indicate the stage of development of a specific sample, thus reflecting the temporal aspects of any previous environmental catastrophe.

6. Identification of the kinds and sources of organic debris.

7. Determination of the viability of those species that may be existing vegetatively (non-reproducing organisms recruited from shallow water).

8. Establishment of an alarm system in supposedly active canyons for warning of turbidity flows so that post-catastrophic sampling and exploration by undersea vehicles could be undertaken to monitor the return of the fauna to climax conditions.

## SUMMARY

1. Soft bottoms in canyon heads, 15-100 m, have a more diverse algal-dwelling amphipod fauna than is found on the coastal shelf in the same depths, but the fauna is not identifiable with that from sand of either very shallow water (4-10 m), the coastal shelf (11-91 m), or the upper coastal slope (92-183 m), because it represents a mixture of elements from those areas. *Paraphoxus bicuspidatus*, a common inhabitant of shelf and slope, is scarce.

2. In depths of 101-200 m the benthic amphipod fauna compares favorably with upper coastal slopes of 92-183 m and *Paraphoxus bicuspidatus* occurs abundantly.

3. Although standing crop is erratic from sample to sample, there is a significant decrease between depths of 600 and 700 m from a level of

about 125 to about 20 g/m$^2$. This marked decline corresponds with the occurrence of the oxygen minimum layer.

4. Four decreasing steps in the density of amphipod individuals occur in canyons, the first at 0-100 m (588 individuals/m$^2$), the second at 101-500 m (54/m$^2$), the third at 501-1000 m (14.7/m$^2$), and the fourth at 1001-1600 m (2.8/m$^2$). Below sill depths of the borderland basins, the average number of amphipods is 6.0/m$^2$, except in the shallow nearshore basins where only 1.2 individuals/m$^2$ are found, apparently in relationship to low dissolved oxygen in subsill waters.

5. There is little change in the faunal composition between the deeper ends of the submarine canyons and the subsill parts of the basins. So far only five amphipod species have been found in the basins that have not been collected in the canyons, although, because several basin systems have greater bottom depths than the canyons, more species are to be expected when trawling with fine nets is undertaken.

6. Widespread and consistently deleterious effects of sediment movement within canyon axes have not been detected. Not all canyon samples have produced amphipods, but all have produced faunal elements of one kind or another. Hartman (1963) has reported on the occurrence of specifically impoverished, brackish and pollution-tolerant canyon faunas that probably result from the emergence of aquifers.

7. Specifically impoverished topical faunas, dominated in part by the amphipod *Protomedeia articulata* in Monterey Canyon, appear to be related to large quantities of organic debris that have settled *en masse*. The poor diversity indicates that a slump may have demolished the prior fauna and that *Protomedeia* and several species of polychaetes represent an early succession.

8. About half of the known coastal shelf Amphipoda have been collected in the shallow depths of the canyons and probably more are present. No faunal disparities except those mentioned in paragraphs 1 and 7 above have been detected that would indicate that canyons comprise a special or a restrictive environment. This statement is supported by the broad spectrum of sediment types collected in the canyon axes.

9. Bathyal indicator species, especially the harpinias, occur at minimum depths of approximately 300 m in the canyons.

10. Several sublittoral Amphipoda seem to be abnormally displaced to great depths via canyon pathways. In some cases this displacement may

be connected with the descent of organic materials, especially detached algae, down the canyon axes. Until non-canyon slopes can be sampled, these displacements must remain figmentary, but the rather restricted depth distribution of these species on the coastal shelf suggest that they are abnormally displaced.

11. The shallowest nearshore basins support a large proportion of eurybathic species, suggesting an association between eurybathicity and tolerance to environmental stresses such as low oxygen values. Nevertheless, only 9 species of amphipods have been collected in the nearshore basins.

12. Deeper offshore basins with oxygen values higher than the shallower nearshore basins have a more diversified amphipod fauna and fewer shelf species.

13. The bathyal amphipod fauna of southern California has little connection with the local sublittoral fauna. Apparently the bathyal members have been derived from cold-temperate sublittoral faunas that have submerged towards the tropics.

14. Seventy-two percent of the 109 samples of the coastal canyons can be divided into 4 major assemblages, based on the polychaetes *Pectinaria*, *Heteromastus*, *Maldane*, and *Lysippe*. The remaining samples are not allocated either because of mixing of dominants or the absence of dominants. A significant proportion of samples from deepwater (600 + m), is not assignable to Petersen-type communities because of the low densities of organisms, absence of clearly dominating species and the lack of subdominant indicator species. The *Pectinaria* and *Heteromastus* assemblages are clearly related to each other through overlapping samples and tests of minimum faunal percentages. The *Pectinaria* (*sensu stricto*) samples may be further subdivided according to the presence of other subdominants: *Capitella*, *Ancistrosyllis*, *Chloeia*, *Dentalium*. A sketchy differentiation in a depth-sediment scheme can be demonstrated. The *Pectinaria-Capitella* association is confined largely to coarse sediments with wide depth range. The *Pectinaria-Ancistrosyllis* association is restricted to finely particulate sediments of shallow water. Fine sediments of slightly deeper water support, in succession, the *Pectinaria-Dentalium* and *Pectinaria-Chloeia* associations followed by the *Maldane* complex. The *Heteromastus* association is scattered across the scheme from coarse to fine sediments in depths between 400 and 550 m, and below that depth the remaining samples are lumped into a *Lysippe-Califia-Aricidea-Terebellides* group that needs further study.

## ACKNOWLEDGMENTS

The field work was made possible by a grant (G-9060) to the Allan Hancock Foundation by the National Science Foundation. My gratitude is extended to those persons and institutions listed by Hartman (1963). This paper was written during my tenure at the Allan Hancock Foundation 1957-1960 and at the Beaudette Foundation of California 1960-1964, and I am indebted to those institutions for their support. Miss Jacqueline M. Hampton of the Beaudette staff prepared several of the figures and drafted all of the graphs. My thanks go especially to Dr. Olga Hartman and Dr. K. O. Emery for their aid and cooperation, and to Mrs. Dorothy M. Halmos and her staff of the Allan Hancock Library for interlibrary loans and reference work.

TABLE 1

Some sedimentary characteristics of canyons and the coastal shelf.

| | Canyons, 0-50 m above axis 55 samples | Coastal shelf 10-183 m 348 samples |
|---|---|---|
| Median of all Median diameters, mm | 0.039 (0.059)* | 0.059 (0.130)* |
| Median point of percent Carbon | 1.05 (1.76)* | 0.53* |

*From Emery 1960, p. 181, Table 12, carbon computed in reverse from organic matter.

TABLE 2

Frequency of animal groups in depth classes of insular canyons, Coronado, Tanner and Catalina, compiled from data of Hartman (1963). Tabulated data represent individuals/m².

| Depth class, m | Polychaetes | Echinoderms | Mollusks | Crustaceans | Others | Total |
|---|---|---|---|---|---|---|
| 100 | 327 | 1395 | 15 | 76 | 2 | 1815 |
| 200 | 342 | 276 | 18 | 142 | 15 | 793 |
| 300 | 217 | 45 | 12 | 41 | 11 | 326 |
| 400 | 336 | 138 | 17 | 46 | 6 | 543 |
| 500 | 112 | 581 | 33 | 120 | 11 | 857 |
| 600 | 577 | 36 | 72 | 20 | 39 | 744 |
| 700 | 187 | 53 | 191 | 21 | 14 | 466 |
| 1000 | 232 | 48 | 22 | 39 | 16 | 357 |
| 1600 | 58 | 21 | 11 | 12 | 21 | 123 |

TABLE 3

Frequency of animal groups in depth classes of mainland canyons, Monterey, Hueneme, Mugu, Dume, Redondo axes, Newport and La Jolla, compiled from data of Hartman (1963). Tabulated data represent individuals/m$^2$.

| Depth class, m | Polychaetes | Echinoderms | Mollusks | Crustaceans | Others | Total |
|---|---|---|---|---|---|---|
| 100 | 1590 | 73 | 111 | 159 | 83 | 2016 |
| 200 | 1075 | 36 | 163 | 319 | 97 | 1690 |
| 300 | 379 | 9 | 67 | 38 | 12 | 505 |
| 400 | 602 | 29 | 33 | 37 | 13 | 714 |
| 500 | 267 | 9 | 326 | 71 | 9 | 399 |
| 600 | 130 | 10 | 28 | 56 | 17 | 241 |
| 700 | 87 | 8 | 38 | 5 | 7 | 145 |
| 1000 | 95 | 5 | 15 | 52 | 15 | 182 |

TABLE 4

Frequency of animal groups in depth classes of all canyons of California, except Santa Cruz Canyon (data incomplete), compiled from data of Hartman (1963). Tabulated data represent individuals/m$^2$.

| Depth class, m | Polychaetes | Echinoderms | Mollusks | Crustaceans | Others | Total |
|---|---|---|---|---|---|---|
| 100 | 1377 | 366 | 157 | 130 | 61 | 2091 |
| 200 | 1738 | 164 | 191 | 298 | 72 | 2463 |
| 300 | 661 | 23 | 67 | 37 | 12 | 800 |
| 400 | 623 | 47 | 26 | 35 | 13 | 744 |
| 500 | 312 | 44 | 160 | 43 | 10 | 569 |
| 600 | 229 | 25 | 37 | 29 | 21 | 341 |
| 700 | 98 | 12 | 53 | 7 | 19 | 189 |
| 1000 | 144 | 13 | 19 | 28 | 13 | 217 |
| 1600 | 43 | 15 | 9 | 9 | 12 | 88 |
| *Coastal shelf, 10-183 m | 1424 | 532 | 470 | 1352 | 125 | 3903 |

*Based on 348 samples apportioned equally to depth classes and geographic zones.

TABLE 5

Communities of the coastal shelf of southern California, based on 348 samples apportioned to the 1061 square miles according to depth and geographic area.

| Name of community | Percent occurrence on shelf | No. of dominant occurrences in 142 canyon samples |
|---|---|---|
| *Amphiodia urtica* | 20.2 | 4 (islands) |
| *Nothria-Tellina* | 19.5 | 0 |
| *Amphiodia-Cardita* | 10.1 | 0 |
| *Listriolobus* | 6.6 | 2 |
| *Amphioplus* | 5.5 | 1 |
| *Diopatra* | 4.3 | 1 |
| *Nothria-Spiophanes* | 4.0 | 0 |
| *Chloeia-Pectinaria* | 4.0 | 4 |
| *Amphiodia-Onuphis* | 2.9 | 0 |
| *Onuphis* | 2.9 | 1 |
| *Amphiacantha* | 2.6 | 0 |
| *Amphiodia digitata* | 1.7 | 0 |
| *Tharyx* | 1.4 | 2 |
| *Amygdalum* | 1.1 | 0 |
| *Chaetopterus* | 0.9 | 0 |
| *Spiophanes missionensis* | 0.9 | 0 |
| *Pinnixa* | 0.9 | 0 |
| *Nothria iridescens-Tellina* | 0.6 | 0 |
| *Branchiostoma* | 0.6 | 0 |
| *Capitella* | 0.6 | 9 |
| *Sthenelanella* | 0.3 | 0 |
| *Pherusa-Onuphis* | 0.3 | 0 |
| *Ampelisca* | 0.3 | 0 |
| *Macoma* | 0.3 | 0 |
| *Sipunculus* | 0.3 | 0 |
| *Ophiothrix* | 0.3 | 0 |
| *Dendraster* | 0.3 | 0 |
| No community dominant | 7.2 | + |

## TABLE 6

The grouping of canyon samples according to their dominants with distribution of species in the samples.

| Group Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Dominants | Pect. | Pect. Dent. | Pect. Cap. | Pect. Anc. | Pect. Chl. | Het. Chl. | Het. | Mald. | Lysip. |
| Sample numbers | 2189 | 4846 | 2190 | 3164 | 5639+ | 2148 | 5531 | 2219 | 2317 |
| | 5114 | 5661 | 7039 | 5367 | 6815 | 2149 | 5688 | 3178 | 2336 |
| | 5115 | 6854 | 7043 | 7030 | 6909 | 6498 | 6903 | 3179 | 6503 |
| | 6818 | 7054 | 7045 | 7284+ | 7160+ | 6499 | 6910 | 3180 | 6820* |
| | 6897 | | | | 7174 | 7160+ | | 3399 | 6828 |
| | 6898 | | | | 7284+ | | | 4851 | 7047 |
| | 7052 | | | | | | | 5639+ | 7050 |
| | 7286 | | | | | | | 6497 | 7051 |
| | 7287 | | | | | | | 6779 | 7728 |
| | 7730 | | | | | | | 6821* | |
| | | | | | | | | 6850* | |
| | | | | | | | | 7028 | |
| | | | | | | | | 7155 | |
| | | | | | | | | 7729 | |
| Individuals/m$^{2}$ [a] | | | | | | | | | |
| *Pectinaria* | 272 | 97 | 650 | 590 | 245 | 53 | 2 | 30 | 1 |
| *Dentalium* | 2 | 155 | 0 | 21 | 1 | 2 | 0 | 13 | 0 |
| *Capitella* | 1 | 0 | 7977 | 19 | 1 | 0 | 0 | 0 | 0 |
| *Ancistrosyllis* | 3 | 11 | 0 | 373 | 79 [c] | 6 | 2 | 0 | 1 |
| *Chloeia* | 23 | 1 | 42 | 88 | 293 | 110 | 6 [c] | 52 [c] | 1 |
| *Heteromastus* | 21 | 45 | 22 | 47 | 4 [c] | 198 | 515 | 1 | 0 |
| *Maldane sarsi* | 2 | 1 | 1 | 0 | 217 [c] | 8 | 0 | 209 | 2 |
| *Lysippe* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 42 |
| *Nothria iridescens* | 4 | 0 | 0 | 0 | 0 | 4 | 2 | 33 | 0 |
| *Spiophanes fimbriata* | 28 | 6 | 1 | 17 | 43 | 1 | 1 | 4 | 1 |
| *Pista disjuncta* | 22 [b] | 34 | 0 | 7 | 4 [c] | 0 | 0 | 6 [c] | 0 |
| *Haploscoloplos* | 46 | 4 | 6 | 3 | 1 | 6 | 36 | 2 | 0 |
| *Aricidea lopezi* | 1 | 0 | 0 | 49 [c] | 2 | 0 | 0 | 0 | 1 |
| Related Samples | 3000 | 7285 | 6780 | 5006 | 2218 | 7523 | 5674 | 2793 | 7041 |
| | 5046 | | 6781 | 5250 | 2727 | | 6900 | | |
| | 6501 | | 6899 | 7029 | 5505 | | 7288 | | |
| | 6822* | | 7046 | 7031 | 5532 | | 7289 | | |
| | 6845* | | | 7038 | 6816 | | | | |

Mixed Samples: 7032 and 3166 = *Pectinaria* & *Heteromastus*; 6819 = *Pectinaria* & *Maldane*

* = island canyon sample

\+ = in two communities

(a) = for purposes of equating OPG and CG samples

(b) = estimate

(c) = largely one sample

TABLE 7

Density of Amphipoda in basins off southern California.

| Name of Basin | Number of Samples | Number of amphipods per $m^2$ (to nearest 0.25) | Sill Depth, m |
|---|---|---|---|
| 1. Santa Barbara | 5 | 2.0 | 475 |
| 2. Santa Monica | 26 | 0.0 | 737 |
| 3. San Pedro | 72 | 2.0 | 737 |
| 4. Santa Catalina | 11 | 6.25 | 974 |
| 5. Santa Cruz | 9 | 9.0 | 1085 |
| 6. San Nicolas | 11 | 5.0 | 1106 |
| 7. Tanner | 6 | 8.0 | 1165 |
| 8. West Cortes | 4 | 2.0 | 1362 |
| 9. San Clemente | 6 | 3.0 | 1816 |
| 10. East Cortes | 3 | 10.0 | 1415 |
| 11. Long | 3 | 7.0 | 1697 |
| 12. Velero | 2 | 0 | 1902 |
| Patton Escarpment | 2 | 20.0 | |
| Shallow Basins (1-3) | | 1.5 | |
| Deep Basins (4-12) | | 6.0 | |

TABLE 8

The abundant species and genera of amphipods in the borderland basins of southern California.

| Name of species | Number of individuals in the samples |
|---|---|
| *Heterophoxus oculatus* | 28 |
| *Harpiniopsis fulgens* | 16 |
| *Liljeborgia cota* | 8 |
| *Harpiniopsis epistomata* | 8 |
| *Coxophoxus hidalgo* | 6 |
| *Pardaliscella symmetrica* | 5 |
| *Harpiniopsis emeryi* | 5 |
| Name of genus | |
| *Harpiniopsis* | 40 |
| *Ampelisca* | 21 |
| *Heterophoxus* | 28 |
| *Byblis* | 9 |
| *Liljeborgia* | 8 |
| *Coxophoxus* | 6 |
| *Pardaliscella* | 5 |

TABLE 9

Amphipoda known from the basins but not from the submarine canyons.

*Harpiniopsis excavata, Bonnierella linearis californica, Sophrosyne robertsoni, Hirondellea fidenter, Lepidepecreella charno, Coxophoxus hidalgo, Ampelisca amblyopsoides.*

TABLE 10

Density of Amphipoda in relation to depth in submarine canyons of California.

| Depth class, m | No. of Samples | Total $m^2$ | No. of Amphipoda | No. of species | No. of Amphipoda per $m^2$ |
|---|---|---|---|---|---|
| 100 | 8 | 2.00 | 1176 | 55 | 588 |
| 200 | 23 | 8.50 | 873 | 60 | 103 |
| 300 | 20 | 8.50 | 374 | 46 | 44 |
| 400 | 21 | 8.25 | 187 | 29 | 23 |
| 500 | 21 | 8.50 | 368 | 27 | 43 |
| 600 | 19 | 7.50 | 70 | 15 | 9.3 |
| 700 | 17 | 7.25 | 61 | 21 | 8.4 |
| 800 | 13 | 5.75 | 160 | 16 | 28 |
| 1000 | 9 | 4.50 | 76 | 20 | 17 |
| 1600 | 5 | 2.50 | 7 | 6 | 2.8 |
| 10–100 (Shelf) | 300 | 60.00 | | Ca. 150 | 695 |
| 3–10 | 100 | 10.00 | | | 257 |

TABLE 11

Abundant Amphipoda of the coastal shelf of southern California, 5-183 m, based on 348 samples, listed in rank, with number of individuals/$m^2$.

*Paraphoxus bicuspidatus,* 58; *Ampelisca brevisimulata,* 44; *Heterophoxus oculatus,* 31; *Ampelisca cristata,* 27; *Paraphoxus abronius,* 23; *Metaphoxus frequens,* 22; *Photis brevipes,* 21; *Amphideutopus oculatus,* 21; *Ampelisca macrocephala,* 17.3; *Paraphoxus similis,* 16.7; *Para-*

*phoxus epistomus,* 16.1; *Paraphoxus obtusidens,* 15.9; *Paraphoxus stenodes,* 14.3; *Aoroides columbiae,* 14.0; *Ampelisca pacifica,* 13.6; *Photis lacia,* 12.0; *Acuminodeutopus heteruropus,* 12.5; *Ampelisca pugetica,* 10.8; *Eurystheus thompsoni,* 7.7; *Listriella goleta,* 7.3; *Byblis veleronis,* 7.2.

## TABLE 12

Abundant Amphipoda of the coastal shelf and upper slope of southern California, 92-183 m, based on 48 samples, listed in rank, with number of individuals/m$^2$.

*Paraphoxus bicuspidatus,* 98; *Ampelisca macrocephala,* 84; *Ampelisca romigi,* 45; *Heterophoxus oculatus,* 35; *Metaphoxus frequens,* 33; *Photis lacia,* 27; *Ampelisca pacifica,* 21; *Phoxocephalus homilis,* 19.0; *Westwoodilla caecula* & *acutifrons,* 15.6; *Ampelisca brevisimulata,* 13.4; *Orchomene decipiens,* 12.0; *Nicippe tumida,* 11.0; *Ampelisca pugetica,* 10.0; *Protomedeia articulata,* 9.6; *Lysianassa holmesi,* 9.2; *Paraphoxus similis,* 8.6; *Paraphoxus robustus,* 8.3; *Urothoe varvarini,* 8.1; *Pardisynopia synopiae,* 7.1; *Lysianassa oculata,* 6.5.

## TABLE 13

Abundant Amphipoda on bottoms of 2-5 m on the coastal shelf of southern California (after J. L. Barnard 1963, Table 16), with numbers of individuals/m$^2$. Phycophilous species are marked with asterisks.

*Paraphoxus epistomus,* 55; *Synchelidium* spp., 2 species, 31; *Mandibulophoxus uncirostratus,* 30; *Photis lacia,* 25; *Paraphoxus bicuspidatus,* aberrant form, 25; *Paraphoxus abronius,* 9.7; *Eohaustorius washingtonianus,* 9.5; *Ampelisca compressa,* 9.2; **Aoroides columbiae,* 7.5; *Monoculodes hartmanae,* 4.9; **Ampithoe* sp., 4.4; *Paraphoxus variatus,* 4.1; **Batea transversa,* 4.1; *Paraphoxus heterocuspidatus,* 3.8; *Ischyrocerus pelagops,* 3.0; **Photis* spp. juveniles, 2.9; *Photis brevipes,* 2.7; *Atylus tridens,* 2.6; *Megaluropus longimerus,* 2.3; *Paraphoxus jonesi,* 2.0; *Argissa hamatipes,* 1.4; *Ampelisca cristata,* 1.0; *Paraphoxus lucubrans,* 1.0; *Tiron biocellata,* 1.0; *Acuminodeutopus heteruropus,* 0.9; **Amphilochus picadurus,* 0.6; *Paraphoxus stenodes,* 0.6; *Paraphoxus obtusidens,* 0.5; *Ericthonius brasiliensis,* 0.5; *Parapleustes pugettensis,* 0.5; *Uristes entalladurus,* 0.4; **Eurystheus thompsoni,* 0.4; *Cerapus tubularis,* 0.4.

TABLE 14

Abundant Amphipoda in submarine canyons, 15-100 m.

| Name of species | No. of individuals in 8 samples | Ecological type |
|---|---|---|
| **Aoroides columbiae* | 197 | A |
| *Parapleustes pugettensis* | 89 | A |
| **Paraphoxus stenodes* | 75 | B |
| **Paraphoxus epistomus* | 65 | B |
| **Photis brevipes* | 56 | A |
| **Listriella goleta* | 43 | S |
| **Paraphoxus obtusidens* | 41 | B |
| **Synchelidium* sp. | 32 | B |
| **Ampelisca cristata* | 32 | T |
| **Ampelisca macrocephala* | 28 | T |
| *Ischyrocerus pelagops* | 24 | A |
| **Ampelisca brevisimulata* | 23 | T |
| *Paraphoxus fatigans* | 20 | B |
| *Paraphoxus spinosus* | 19 | B |
| *Ampelisca compressa* | 17 | T |
| *Protomedeia articulata* | 14 | T |

A = algal dweller; B = burrower; T = builder of tubes; S = ?maldanid commensal.
* = a major shelf species.

TABLE 15

Abundant Amphipoda in submarine canyons, 101-200 m. Species are listed in rank, with their numbers of specimens in 23 samples. Species also dominating slope depths of 92-183 m are marked with asterisks. See Table 12.

**Heterophoxus oculatus,* 118; **Metaphoxus frequens,* 114; **Paraphoxus bicuspidatus,* 107; **Ampelisca macrocephala,* 72; **Phoxocephalus homilis,* 67; * *Orchomene decipiens,* 34; **Photis lacia,* 31; *Maera danae,* 30; **Paraphoxus similis,* 30; **Westwoodilla c. acutifrons,* 22; **Nicippe tumida,* 16; *Pachynus barnardi,* 12; *Photis brevipes,* 10; *Listriella eriopisa,* 10; **Ampelisca pacifica,* 10.

TABLE 16

The most abundant Amphipoda in each depth regime of the submarine canyons, abstracted from Appendix I. See Table 14 for the depths of 15-100 m.

| Depth, m | No. of samples | Amphipod | No. of specimens in the samples |
|---|---|---|---|
| 100–200 | 23 | *Heterophoxus oculatus* | 118 |
| | | *Metaphoxus frequens* | 114 |
| | | *Paraphoxus bicuspidatus* | 107 |
| | | *Ampelisca macrocephala* | 72 |
| | | *Phoxocephalus homilis* | 67 |
| | | *Orchomene decipiens* | 34 |
| | | *Photis lacia* | 31 |
| | | *Maera danae* | 30 |
| | | *Paraphoxus similis* | 30 |
| | | *Westwoodilla c. acutifrons* | 22 |
| 201–300 | 20 | *Heterophoxus oculatus* | 69 |
| | | *Ampelisca macrocephala* | 51 |
| | | *Phoxocephalus homilis* | 28 |
| | | *Maera simile* | 22 |
| | | *Ampelisca pacifica* | 16 |
| 301–400 | 21 | *Ampelisca macrocephala* | 51 |
| | | *Heterophoxus oculatus* | 33 |
| | | *Phoxocephalus homilis* | 18 |
| | | *Harpiniopsis fulgens* | 13 |
| 401–500 | 21 | *Paraphoxus calcaratus* | 99 |
| | | *Photis* spp. juvs. | 93 |
| | | *Paraphoxus obtusidens* | 48 |
| | | *Harpiniopsis epistomata* | 26 |
| | | *Phoxocephalus homilis* | 17 |
| | | *Byblis ?veleronis* | 16 |
| | | *Heterophoxus oculatus* | 9 |
| 501–600 | 19 | *Harpiniopsis epistomata* | 32 |
| | | *Ampelisca macrocephala unsocalae* | 6 |
| | | *Byblis barbarensis* | 6 |
| | | *Liljeborgia cota* | 5 |
| 601–700 | 17 | *Ampelisca macrocephala unsocalae* | 22 |
| | | *Harpiniopsis epistomata* | 7 |
| | | *Proboloides tunda* | 7 |

TABLE 16 (Cont.)

| Depth, m | No. of samples | Amphipod | No. of specimens in the samples |
|---|---|---|---|
| 701–800 | 13 | (*Protomedeia articulata*) | 111 |
| | | *Harpiniopsis epistomata* | 16 |
| | | oedicerotid | 7 |
| | | *Harpiniopsis fulgens* | 5 |
| | | *Ampelisca macrocephala unsocalae* | 4 |
| | | *Byblis barbarensis* | 4 |
| | | *Heterophoxus oculatus* | 4 |
| 801-1000 | 9 | (*Protomedeia articulata*) | 20 |
| | | *Ampelisca macrocephala unsocalae* | 14 |
| | | (*Paraphoxus daboius*) | 9 |
| | | *Harpiniopsis epistomata* | 4 |
| 1001–1620 | 5 | None Abundant | |

TABLE 17

Percent of shelf (sublittoral) and slope (bathyal) species of Amphipoda in depth intervals of the canyons, from Appendix I.

| Depth, m | Total no. of species | No. from shelf | No. from slope | No. of Eurybathic | Unknown |
|---|---|---|---|---|---|
| 15-100 | 56 | 54 | 0 | 2 | 0 |
| 101-200 | 60 | 56 | 2 | 2 | 0 |
| 201-300 | 46 | 41 | 1 | 2 | 2 |
| 301-400 | 29 | 21 | 4 | 3 | 1 |
| 401-500 | 27 | 17 | 7 | 3 | 0 |
| 501-600 | 15 | 5 | 9 | 1 | 0 |
| 601-700 | 20 | 7 | 12 | 1 | 0 |
| 701-800 | 16 | 7 | 8 | 1 | 0 |
| 801-1000 | 20 | 2 | 16 | 2 | 0 |
| 1001-1620 | 6 | 0 | 6 | 0 | 0 |

TABLE 18

Known depth distribution of Amphipoda recorded from submarine canyons and basins of California. The species are arranged in successive groups according to their minimum depths, group one in depths of 0-20 m, group 2 in depths of 20-100 m, with succeeding groups in intervals of 100 m thereafter. Within each group the species are arranged by their mid-depths.

| Name of species | Depth, m Minimum | Maximum | Mid-depth |
|---|---|---|---|
| *Ischyrocerus pelagops* | 0 | 24 | 12 |
| *Pseudokoroga rima* | 2 | 30 | 16 |
| *Megaluropus longimerus* | 9 | 27 | 18 |
| *Acuminodeutopus heteruropus* | 1 | 82 | 41 |
| *Synchelidium* sp. G | 2 | 89 | 46 |
| *Ampithoe mea* | 0 | 89 | 45 |
| *Synchelidium rectipalmum* | 2 | 90 | 46 |
| *Parapleustes pugettensis* | 0 | 120 | 60 |
| *Atylus tridens* | 0 | 135 | 68 |
| *Monoculodes hartmanae* | 1 | 142 | 72 |
| *Amphideutopus oculatus* | 2 | 162 | 82 |
| *Synchelidium shoemakeri* | 0 | 168 | 84 |
| *Podocerus cristatus* | 0 | 171 | 86 |
| *Ericthonius brasiliensis* | 0 | 171 | 86 |
| *Melita dentata* | 0 (north) | 177 "672" | 89 |
| *Eurystheus thompsoni* | 0 | 218 | 109 |
| *Maera simile* | 0 | 221 | 111 |
| *Ceradocus spinicaudus* | 0 (north) | 221 | 111 |
| *Microdeutopus schmitti* | 0 | 221 | 111 |
| *Ampelisca lobata* | 0 | 234 (?549) | 117 |
| *Photis brevipes* | 0 | 266 | 133 |
| *Ampelisca compressa* | 1 | 330 (?676) | 166 |
| *Maera danae* | 2 | 362 | 182 |
| *Gitanopsis vilordes* | 0 | 374 | 187 |
| *Aoroides columbiae* | 0 | 298 (?374) | 199 |
| *Paraphoxus obtusidens* | 0 | 459 | 230 |
| *Paraphoxus epistomus* | 0 | 507 | 254 |
| *Paraphoxus spinosus* | 2 | 519 | 261 |
| *Melphisana bola* | 13 | 76 | 45 |
| *Paraphoxus variatus* | 5 | 93 | 49 |
| *Paraphoxus lucubrans* | 9 | 91 | 50 |

TABLE 18 (Cont.)

| Name of species | Depth, m Minimum | Maximum | Mid-depth |
|---|---|---|---|
| *Photis bifurcata* | 11 | 93 | 52 |
| *Listriella melanica* | 12 | 97 | 55 |
| *Sympleustes subglaber* | 18 | 116 | 67 |
| *Paraphoxus heterocuspidatus* | 13 | 146 | 80 |
| *Lysianassa holmesi* | 11 | 167 | 89 |
| *Opisa tridentata* | 17 | 162 | 90 |
| *Photis lacia* | 11 | 180 | 96 |
| *Anonyx carinatus* | 15 | 180 | 98 |
| *Ampelisca milleri* | 15 | 187 | 101 |
| *Ampelisca hancocki* | 9 | 210 | 110 |
| *Stenothoides bicoma* | 15 | 218 | 117 |
| *Westwoodilla c. acutifrons* | 12 | 266 | 139 |
| *Paraphoxus abronius* | 9 | 274 | 142 |
| *Ampelisca cristata* | 6 | 310 | 158 |
| *Paraphoxus robustus* | 4 | 319 | 162 |
| *Paraphoxus stenodes* | 5 | 374 | 190 |
| *Pachynus barnardi* | 12 | 373 | 193 |
| *Paraphoxus fatigans* | 12 | 385 | 199 |
| *Prachynella lodo* | 10 | 459 | 235 |
| *Ampelisca brevisimulata* | 16 | 456 | 236 |
| *Listriella goleta* | 12 | 459 | 236 |
| *Paraphoxus bicuspidatus* | 8 | 475 | 242 |
| *Ampelisca romigi* | 3 | 504 | 254 |
| *Metaphoxus frequens* | 13 | 496 | 255 |
| *Listriella eriopisa* | 11 | 560 | 286 |
| *Acidostoma hancocki* | 15 | 672 | 344 |
| *Listriella albina* | 16 | 721 | 369 |
| *Ampelisca pugetica* | 9 | 765 | 387 |
| *Protomedeia articulata* | 18 | 906 | 462 |
| *Hippomedon denticulatus* | 0 | 924 | 462 |
| *Argissa hamatipes* | 4 | 1096 | 550 |
| *Ampelisca macrocephala* | 5 | 1686 | 846 |
| *Heterophoxus oculatus* | 2 | 1941 | 972 |
| *Bathymedon roquedo* | 22 | 107 | 65 |
| *Garosyrrhoe bigarra* | 44 | 89 | 67 |
| *Paraphoxus tridentatus* | 55 | 89 | 72 |
| *Hippomedon tenax* | 88 | | 88 |
| *Dexamonica reduncans* | 51 | 180 | 116 |

TABLE 18 (Cont.)

| Name of species | Depth, m Minimum | Maximum | Mid-depth |
|---|---|---|---|
| *Monoculodes emarginatus* | 55 | 200 | 128 |
| *Haploops spinosa* | 88 | 171 | 130 |
| *Photis macrotica* | 55 | 221 | 138 |
| *Metopella aporpis* | 84 | 218 | 151 |
| *Paraphoxus similis* | 31 | 324 | 178 |
| *Ericthonius difformis* (*hunteri*) | 68 | 352 | 210 |
| *Byblis veleronis* | 31 | 422 (?786) | 227 |
| *Orchomene pacifica* | 46 | 421 | 234 |
| *Ampelisca pacifica* | 24 | 496 | 247 |
| *Pardisynopia synopiae* | 53 | 496 | 275 |
| *Phoxocephalus homilis* | 62 | 644 | 353 |
| *Paraphoxus calcaratus* | 75 | 689 | 382 |
| *Monoculodes norvegicus* | 20 | 786 | 403 |
| *Orchomene decipiens* | 35 | 793 | 414 |
| *Paraphoxus daboius* | 77 | 813 | 445 |
| *Urothoe varvarini* | 31 | 1292 | 662 |
| *Harpiniopsis similis hondanada* | 57 | 1298 | 678 |
| *Nicippe tumida* | 34 | 1367 | 701 |
| *Ampelisca macrocephala unsocalae* | 72 | 1687 | 880 |
| *Pardaliscella symmetrica* | 92 | 1749 | 921 |
| *Protomedeia prudens* | 121 | | 121 |
| *Schisturella cocula* | 162 | | 162 |
| *Thrombasia tracalero* | 167 | | 167 |
| *Syrrhoe* sp. | 177 | | 177 |
| *Monoculodes perditus* | 177 | | 177 |
| *Bruzelia tuberculata* | 121 | 565 | 343 |
| *Harpiniopsis fulgens* | 128 | 2059 | 1094 |
| *Pardaliscoides fictotelson* | 218 | | 218 |
| *Mesometopa neglecta roya* | 221 | | 221 |
| *Ampelisca furcigera* | 210 (60 in north) | 384 | 297 |
| *Monoculodes glyconica* | 226 | 503 | 365 |
| *Paraphoxus oculatus* | (27) North 239 | 1135 | 685 |
| *Leptophoxus falcatus* | (56) North 249 | 2258 | 1255 |
| *Harpiniopsis naiadis* | 338 | 976 | 657 |
| *Monoculodes latissimanus* | 344 | 1096 | 720 |
| *Harpiniopsis epistomata* | 371 | 1626 | 999 |

TABLE 18 (Cont.)

| Name of species | Depth, m Minimum | Maximum | Mid-depth |
|---|---|---|---|
| *Liljeborgia cota* | 366 | 1821 | 1094 |
| *Harpiniopsis emeryi* | 344 | 2702 | 1234 |
| *Uristes californicus* | (420) | 924 | 672 |
| *Harpiniopsis excavata* | 425 | 5110 | 2768 |
| *Byblis bathyalis* | 496 | 950 | 723 |
| *Melphidippa (?) amorita* | 496 | | 496 |
| *Proboloides tunda* | 545 | 611 | 578 |
| *Ampelisca coeca* | 553 | 793 | 673 |
| *Byblis barbarensis* | 503 | 902 | 703 |
| *Bathymedon covilhani* | 549 | 1533 | 1041 |
| *Oediceropsis elsula* | 644 | | 644 |
| *Ampelisca romigi ciego* | 603 | 813 | 708 |
| *Bathymedon kassites* | 750 | 906 | 823 |
| *Oediceropsis morosa* | 813 | | 813 |
| *Byblis tannerensis* | 813 | 1138 | 976 |
| *Ampelisca plumosa* | 813 | 1821 | 1317 |
| *Oediceropsis trepadora* | 875 | 1406 | 1141 |
| *Schisturella zopa* | | 914 | 914 |
| *Tosilus arroyo* | | 976 | 976 |
| *Harpiniopsis profundis* | (385) 976 | 1135 | 1056 |
| *Hirondellea fidenter* | | 1227 | 1227 |
| *Ampelisca amblyopsoides* | 1123 | 1481 | 1299 |
| *Ampelisca eoa* | 1135 (421 in north) | 1833 | 1481 |
| *Harpiniopsis petulans* | | 1265 | 1265 |
| *Sophrosyne robertsoni* | | 1298 | 1298 |
| *Bonnierella linearis californica* | 1292 | 1608 | 1450 |
| *Metopa samsiluna* | | 1620 | 1620 |
| *Tryphosa index* | | 1620 | 1620 |
| *Coxophoxus hidalgo* | | 1675 | 1675 |
| *Bruzelia ascua* | | 1687 | 1687 |
| *Lepidepecreella charno* | | 1895 | 1895 |

TABLE 19

Amphipoda occurring in greater depths on canyon floors than on the coastal shelf. Species associated with plants are marked with an asterisk (*).

| Name of Species | Apparent Maximum Coastal Shelf Depth, m | Known Canyon Depth, m |
|---|---|---|
| **Atylus tridens* | 10 | 135 |
| **Ceradocus spinicaudus* | 20 | 221 |
| **Gitanopsis vilordes* | 30 | 374 |
| **Paraphoxus abronius* | 40 | 274 |
| *Paraphoxus heterocuspidatus* | 30 | 146 |
| *Paraphoxus stenodes* | 50 | 374 |
| **Photis bifurcata* | 50 | 93 |
| *Paraphoxus lucubrans* | 50 | 91 |
| *Paraphoxus variatus* | 50 | 93 |
| *Monoculodes hartmanae* | 50 | 142 |
| *Microdeutopus schmitti* | 60 | 221 |
| *Stenothoides bicoma* | 70 | 218 |
| *Paraphoxus epistomus* | 100 | 507 |
| **Ampelisca lobata* | 100 | 221 |
| *Ampelisca cristata* | 200 | 310 |

TABLE 20

Frequency of *Listriella* in individuals/m$^2$ in various depth classes on the coastal shelf and in the canyons.

| | *Depth, m, on the coastal shelf* | | | | | |
|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 40 | 50 | 100 |
| *eriopisa* | 1.6 | 4.6 | 1.9 | 1.6 | 0.3 | 1.2 |
| *goleta* | 4.0 | 16.3 | 14.4 | 1.6 | 3.0 | 0.4 |
| *albina* | 0.3 | 2.1 | 0.7 | 0 | 0 | 0.4 |

| | *Depth, m, in the canyons* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 |
| *eriopisa* | 1.0 | 1.2 | 0.5 | 0.1 | 0 | 0.1 | 0 | 0 |
| *goleta* | 14.3 | 0.5 | 0.3 | 0.4 | 0.1 | 0 | 0 | 0 |
| *albina* | 0 | 0.3 | 1.5 | 1.0 | 0 | 0.4 | 0 | 0.2 |

TABLE 21

Number of species of Amphipoda per depth class in the canyons and basins of California. Based not only on direct collections, but implemented also by inclusion of the known depth range from all sources of the species collected in the canyons and basins.

| Depth Class, m | 0–20 | 21–40 | 41–100 | 101–200 | 201–300 | 301–400 | 401–500 |
|---|---|---|---|---|---|---|---|
| No. of species | 64 | 64 | 81 | 76 | 74 | 51 | 44 |

| 501–600 | 601–800 | 801–1000 | 1001–1200 | 1201–1600 | 1601–2000+ |
|---|---|---|---|---|---|
| 35 | 34 | 31 | 25 | 18 | 16 |

TABLE 22

List of Amphipoda discussed in this paper that are known from geographic areas outside of the northeastern Pacific. Arranged in order of increasing median depth, from Table 18.

| Name of species | Median depth, m | Extrinsic Distribution |
|---|---|---|
| *Megaluropus longimerus* | 18 | West Africa |
| *Ampithoe mea* | 45 | NW Pacific |
| *Podocerus cristatus* | 86 | Australasia |
| *Ericthonius brasiliensis* | 86 | Tropicopolitan |
| *Melita dentata* | 89 | ?Circumboreal |
| *Haploops spinosa* | 130 | NW Atlantic |
| *Ampelisca compressa* | 166 | West Atlantic |
| *Maera danae* | 182 | West Atlantic |
| *Ericthonius difformis* | 210 | ?Circumboreal |
| *Paraphoxus obtusidens* | 230 | NW & SE Pacific |
| *Orchomene pacifica* | 234 | NW Pacific |
| *Paraphoxus epistomus* | 254 | West Atlantic |
| *Paraphoxus spinosus* | 261 | West Atlantic |
| *Westwoodilla caecula,* forma *acutifrons* | 266 | NE Atlantic |
| *Ampelisca furcigera* | 297 | Japan Sea |
| *Bruzelia tuberculata* | 343 | NE Atlantic |
| *Paraphoxus calcaratus* | 382 | NW Pacific |
| *Monoculodes norvegicus* | 403 | ?Circumboreal |
| *Hippomedon denticulatus* | 462 | NE Atlantic |

TABLE 22 (Cont.)

| Name of species | Median depth, m | Extrinsic Distribution |
|---|---|---|
| *Argissa hamatipes* | 550 | ?Cosmopolitan |
| *Urothoe varvarini* | 662 | NW Pacific |
| *Paraphoxus oculatus* | 685 | North Atlantic |
| *Nicippe tumida* | 701 | ?Cosmopolitan |
| *Monoculodes latissimanus* | 720 | North Atlantic |
| *Ampelisca macrocephala* | 846 | Circumboreal |
| *Leptophoxus falcatus* ssp. | 1255 | North Atlantic |
| *Sophrosyne robertsoni* | 1298 | Firth of Clyde |
| *Bonnierella linearis* ssp. | 1450 | Peru |
| *Ampelisca eoa* | 1481 | NW Pacific |

TABLE 23

List of genera found in both the sublittoral and bathyal of southern California and the number of local bathyal species in each genus.

Sublittoral-Bathyal Genera: *Ampelisca* (5), *Byblis* (3), *Liljeborgia* (1), *Metopa* (1), *Monoculodes* (2), *Paraphoxus* (1), *Protomedeia* (1), *Tryphosa* (1), *Uristes* (2).

Bathyal Genera: *Bathymedon* (2), *Bonnierella* (1), *Bruzelia* (2), *Coxophoxus* (1), *Harpiniopsis* (7), *Hirondellea* (1), *Lepidepecreella* (1), *Leptophoxus* (1), *Melphidippa* (1), *Mesometopa* (1), *Pardaliscoides* (1), *Oediceropsis* (4), *Proboloides* (1), *Schisturella* (2), *Sophrosyne* (1), *Syrrhoe* (1), *Thrombasia* (1), *Tosilus* (1).

## SYSTEMATICS

Data on depths and new records are not included because the summarized depth ranges may be found in table 18 for all species herein discussed. Station records are noted and the reader may find precise data for each station in Hartman (1963).

### Family AMPELISCIDAE

#### Ampelisca amblyopsoides J. L. Barnard

*Ampelisca amblyopsoides* J. L. Barnard 1960a: 24-25, fig. 4.

*Basin material:* 6346(3).

*Slope material:* 3030(1).

#### Ampelisca brevisimulata J. L. Barnard

*Ampelisca brevisimulata* J. L. Barnard 1954b: 33-35, pls. 23-24.

*Canyon material:* 4851(4), 5006(1), 5367(13), 5960(2), 6899(2), 7030(1), 7031(8), 7038(1).

*Slope material:* 3204(1).

#### Ampelisca coeca Holmes

*Ampelisca coeca* Holmes 1908: 515-516, fig. 24; J. L. Barnard 1960a: 25-26, fig. 5.

*Canyon material:* 7047 (one specimen, 19 mm), 7050(1), 7051(1).

*Basin material:* 2440(1).

*Slope material:* 2369(1).

*Remarks:* The large specimen of 7047 has uropod 1 as long as uropod 2, in contrast to J. L. Barnard's review of the species.

#### Ampelisca compressa Holmes

*Ampelisca compressa* Holmes 1905: 480-481, fig.; Kunkel 1918:66; J. L. Barnard 1960a: 31-32.

*Ampelisca vera* J. L. Barnard 1954b: 23-26, pls. 14-16.

*Canyon material:* 3000(1), 3180(1), 3385(1), 4851(5), 5367(15), 6812(?3), 6821(2), 7031(2).

*Slope material:* 3204 (3), 2227(5), 2228(?1).

#### Ampelisca cristata Holmes

*Ampelisca cristata* Holmes 1908: 507-508, figs. 16-17; J. L. Barnard 1954b (incl. formae): 26-29, pls. 17-18; J. L. Barnard 1959c: 18 (incl. formae).

*Canyon material:* 4852(30), 5367(1), 7031(1).

*Slope material:* 2361(1).

### Ampelisca eoa Gurjanova

*Ampelisca eoa* Gurjanova 1951: 313-314, fig. 178; J. L. Barnard 1960a: 25.

*Ampelisca catalinensis* J. L. Barnard 1954b: 7-9, pls. 1-2.

*Basin material:* 2849(1), 2850(1), 5938(4), 6348(2), 6350(1).

*Remarks:* In the boreal Pacific ranging from 421 to 1000 m, in southern California from 1135 to 1833 m.

### Ampelisca furcigera Bulycheva

*Ampelisca furcigera* Bulycheva 1936: 242-244, figs. 1-3; Gurjanova 1938: 256, fig. 4; Gurjanova 1951: 314-316, fig. 180; J. L. Barnard 1960a: 26-27, fig. 6.

*Slope material:* 2227(2), 2344(1), 2423(1), 3204(1).

*Remarks:* In the boreal Pacific ranging from 60 to 386 m, in southern California from 210 to 384 m.

### Ampelisca hancocki J. L. Barnard

*Ampelisca hancocki* J. L. Barnard 1954b: 37-38, pl. 26.

*Canyon material:* 6803(5), 6846(1).

*Slope material:* 3204(1).

### Ampelisca lobata Holmes

*Ampelisca lobata* Holmes 1908: 517-518, fig. 25; Shoemaker 1942: 7; J. L. Barnard 1954b: 11-14, pls. 5-6 (with references).

*Ampelisca articulata* Stout 1913: 639-640.

*Canyon material:* 6805(3), 6806(2).

*Slope material:* 2227(1), 2230(?1).

### Ampelisca macrocephala Liljeborg

*Ampelisca macrocephala* Liljeborg.—Gurjanova 1951: 308-309, fig. 171; J. L. Barnard 1954b: 41-43, pl. 29; J. L. Barnard 1960a: 28.

*Canyon material:* 3176(1), 3385(1), 4851(56), 4852(2), 6494(1), 6499(1), 6803(25), 6804(2), 6806(7), 6818(2), 6819(4), 6821(3), 6835(13), 6845(15), 6846(4), 6849(22), 6897(6), 6898(2), 6909?(5), 7038(5), 7039(4), 7044(1), 7045(2), 7135(1).

*Basin material:* 2343(3).

*Slope material:* 2227(33), 2344(1), 3204(11).

### Ampelisca macrocephala unsocalae J. L. Barnard

*Ampelisca macrocephala unsocalae* J. L. Barnard 1960a: 28-30, fig. 7.

*Canyon material:* 5046(1), 6803(2), 6808(1), 6812(?8), 6820(2), 6830(1), 6833(13), 6836(3), 6909(3), 6911(14), 6912(1), 6915(26), 6916(4), 7032(1), 7396(1), 7728(?1).

*Basin and Patton Escarpment:* 5937(1), 5938(1), 6348(3).

*Slope material:* 2228(13), 2367(6), 2852(2), 3031(1), 5616(2).

### Ampelisca milleri J. L. Barnard

*Ampelisca milleri* J. L. Barnard 1954b: 9-11, pls. 3-4.

*Canyon material:* 6803( ?1).

### Ampelisca pacifica Holmes

*Ampelisca pacifica* Holmes 1908: 511-513, figs. 20-22; J. L. Barnard 1954b: 31-33, pls. 21-22.

*Canyon material:* 4851(3), 6803(4), 6806(12), 6836(2), 6845(3), 6846(4).

*Slope material:* 2227(9), 3204(2).

### Ampelisca plumosa Holmes

*Ampelisca plumosa* Holmes 1908: 509-510, fig. 18; J. L. Barnard 1960a: 30-31, fig. 8.

*Canyon material:* 6833(2).

*Basin material:* 5937(3), 5938(2), 6351(3).

### Ampelisca pugetica Stimpson

*Ampelisca pugetica* Stimpson.—J. L. Barnard 1954b: 49-51, pls. 35-36; J. L. Barnard 1960a: 31, fig. 9.

*Ampelisca californica* Holmes 1908: 513-515, fig. 23.

*Ampelisca gnathia* J. L. Barnard 1954b: 46-48, pls. 33-34.

*Canyon material:* 3180 (1), 6779 (2), 6803 (12), 6804 (3), 6806 (4), 6819 (4), 6821 (2), 6822 (1), 6836 (1), 6849 (1).

*Basin material:* 2343 (3).

*Slope material:* 2227 (7), 3204 (1), 7134 (1), 7135 (1), 7136 (1).

### Ampelisca romigi J. L. Barnard

*Ampelisca romigi* J. L. Barnard 1954b: 18-20, pls. 10-11; J. L. Barnard 1960a: 34.

*Ampelisca isocornea* J. L. Barnard 1954b: 20-21, pl. 12.

*Canyon material:* 6804 (2), 6835 (2).

*Slope material:* 2414 (1).

### Ampelisca romigi ciego, new subspecies

(Figs. 1, 2)

*Ampelisca romigi* J. L. Barnard 1954b: 18-20, pls. 10, 11.

*Diagnosis:* Like the stem subspecies, but corneal lenses absent and the outer ramus of the third uropod less uncinate.

Juvenile animals lack the notch on the anterior edge of article 5 of pereopod 5.

*Holotype:* AHF No. 607, ?female, 9.5 mm.

*Type locality:* Station 6833, Tanner Canyon, 32°-37′54″N, 118°-5′-40″ W, 813 m, January 29, 1960, bottom of green muddy sand.

*Canyon material:* 6834(2), 6833(2).

### Ampelisca spp.

*Material:* 5925(3), 5940(1), 5942(1), 5943(1), 6834(1).

### Genus **Byblis** Boeck

*Byblis.*—Stebbing 1906: 111-112.

*Remarks:* Although Schellenberg (1931) had precedent in assigning *B. subantarctica* to *Byblis* because of the condition of *B. anisuropa* Stebbing (1908), I am transferring it to the genus *Ampelisca* and I believe that *B. anisuropa* also should be removed to *Ampelisca.*

Since the early concepts of *Ampelisca* and *Byblis* based on European faunas were formulated, several intergrading species have been discovered. *Byblis* differed from *Ampelisca* in the dense setation on the anteroventral edge of the lobe on article 2 of pereopod 5, between the ventral border and its juncture with the stem of the article. In addition, article 6 of pereopod 5 was narrow and article 7 spiniform. Another character of *Byblis* was the short, broad telson, never cleft more than halfway, whereas in *Ampelisca* the telson was elongated, deeply cleft and had tapering apices. Species such as those named above have been described and assigned to *Byblis.* They lack the full setation of pereopod 5 but bear the narrow sixth and seventh articles. Those species also have deeply cleft telsons of medium elongation and they should be transferred to *Ampelisca,* even though the sixth and seventh articles of pereopod 5 are typical of *Byblis.* They join a similar species, *Ampelisca byblisoides* K. H. Barnard (1925).

This arrangement leaves *Byblis* with typical setation of pereopod 5 and a short telson cleft halfway or less. *Byblis subantarctica* is very closely related to and possibly synonymous with *Ampelisca hemicryptops* K. H. Barnard (1930).

### Key to Species of **Byblis**

1. Corneal lenses absent ........................................ 2
1. Corneal lenses present ........................................ 10
2. Cleft of telson one fourth or less ........................................ 3
2. Cleft of telson halfway or more ........................................ 5
3. Lateral cephalic lobe with ventral margin parallel to dorsal margin of head ........................................*ceylonica*

3. Ventrolateral margin of head oblique .......... 4
4. Article 2 of antenna 1 about half as long as article 4 of antenna 2 .......... *abyssi*
4. Article 2 of antenna 1 about as long as article 4 of antenna 2 .......... *guernei*
5. Antenna 1 extending beyond peduncle of antenna 2 .......... 6
5. Antenna 1 as short as peduncle of antenna 2 .......... 8
6. Article 5 of pereopod 3 with long posterior lobe, coxae 2-4 shorter than coxa 1 .......... *antarctica*
6. Article 5 of pereopod 3 lacking posterior lobe, coxae 2-4 as long as coxa 1 .......... 7
7. Antenna 1 scarcely exceeding peduncle of antenna 2, rami of uropod 3 multiserrate on facing edges .......... *tannerensis*, n. sp. (in part)
7. Antenna 1 nearly as long as antenna 2, uropod 3 with one serration on medial edge of outer ramus .......... *crassicornis*
8. Antenna 2 longer than body .......... *barbarensis*
8. Antenna 2 shorter than body .......... 9
9. Antenna 1 extending slightly beyond end of peduncle of antenna 2 .......... *tannerensis*, n. sp. (in part)
9. Antenna 1 scarcely exceeding article 4 of antenna 2 .......... *minuticornis*
10. Ventral pair of corneal lenses situated beneath lateral cephalic margin, not visible laterally, head bearing distinct rostrum nearly half as long as article 1 of antenna 1 .......... *securiger*[1]
10. Ventral pair of corneal lenses situated on lateral cephalic surface, rostrum absent or very short .......... 11
11. Article 5 of pereopod 2 four times as long as article 5 of pereopod 1 .......... *lepta*
11. Article 5 of pereopods 1 and 2 subequal in length .......... 12
12. Cleft of telson one fifth or less .......... 13
12. Cleft of telson one third or more .......... 14
13. Article 5 of antenna 2 shorter than article 4, article 6 of pereopods 1 and 2 much longer than article 5 .......... *gaimardi*
13. Article 5 of antenna 2 equal to article 4, article 6 of pereopods 1 and 2 not much longer than article 5 .......... *longicornis*
14. Antenna 1 exceeding peduncle of antenna 2 by a length equal to article 5 of antenna 2, or less .......... 15

[1] *Haploops securiger* K. H. Barnard (see 1932) is removed to *Byblis* because article 2 of pereopod 5 is distally broadened.

14. Antennae 1 and 2 subequal in length ........................................ 20
15. Article 2 of first antenna 1.5 times as long as article 1 or less ........................................ 16
15. Article 2 of first antenna twice as long as article 1 or longer ........................................ 17
16. Ventral and anterior margins of head blending evenly ........................................ *crenulata* [and *daleyi* (of Giles, 1890)[2]]
16. Ventral margin of head sharply set off from anterior [these two species are separated by the shape of article 2 of pereopod 5 which should be examined in the original] ........................................ *affinis* and *rhinoceros*
17. Article 5 of pereopod 5 scarcely longer than article 6 ........................................ 18
17. Article 5 of pereopod 5 one and seven-tenths times as long as article 6 ........................................ *kallarthra*
18. Article 2 of antenna 1 nearly half as long as article 4 of antenna 2 ........................................ 19
18. Article 2 of antenna 1 one-fourth as long as article 4 of antenna 2 ........................................ *serrata*
19. Article 4 of antenna 2 longer than peduncle of antenna 1 ........................................ *veleronis* (in part)
19. Article 4 of antenna 2 shorter than peduncle of antenna 1 ........................................ *affinis* (in part)
20. Pereopod 4 with acute cusp on ventral edge of article 2 ........................................ *mucronata*
20. Pereopod 4 lacking acute cusp on article 2 ........................................ 21
21. Corneal lenses very small ........................................ *erythrops*
21. Corneal lenses large ........................................ 22
22. Anteroventral corner of head rounded, corneal lenses occupying corner ........................................ *veleronis* (in part)
22. Anteroventral corner of head sharp, corneal lenses posterior to corner ........................................ *bathyalis* and ?*japonica*

### Byblis barbarensis J. L. Barnard

*Byblis barbarensis* J. L. Barnard, 1960a: 34, fig. 11 (in part, see *B. tannerensis*).

*Canyon material:* 6808(1), 6812(1), 6820(2), 6831(3), 6837(1), 7047(4), 7051(1).

*Basin material:* 3731(2).

---

[2] ?*B. daleyi* Giles of Pirlot (1936) has article 3 of antenna 1 nearly three times as long as article 1 and therefore differs from Giles' account.

### **Byblis bathyalis,** new species

(Figs. 3, 4)

*Diagnosis:* Antenna 1 nearly as long as antenna 2; antenna 2 nearly as long as body; corneal lenses large, lower pair occupying ventral margin of head posterior to sharp anteroventral cephalic cusp; pereopod 2 not elongated and enlarged like *Byblis lepta* (Giles); pereopod 4 lacking acute cusp on article 2; article 7 of pereopod 5 more than half as long as article 6; facing edges of rami of uropod 3 serrate; telson cleft almost halfway.

*Holotype:* AHF No. 609, female, 9.7 mm.

*Type locality:* Station 6836, Tanner Canyon, California, 32°-36′-00″N, 119°-05′-18″W, 496 m, January 29, 1960.

*Canyon material:* The 17 specimens of type material and two specimens from station 6838. The latter specimens have article 7 of pereopod 5 almost as long as article 6 and the rami of uropod 3 are considerably less serrate than in the type-series.

*Relationship:* This species differs from *Byblis veleronis* J. L. Barnard (1954b) in the shape of the head, the ventrolateral corner being pointed and the lower lens not occupying that corner, whereas in *B. veleronis* the rounded anteroventral corner of the head is occupied by the lower lens. *Byblis affinis* Sars differs from this species in the shorter cleft of the telson and the shorter first antenna. The material attributed to *Byblis daleyi* (Giles) by Pirlot (1936) is very similar but the anteroventral cephalic corner is rounded and the telson is less deeply cleft.

The identification of this material with *Byblis japonica* Dahl (1944) is problematical, for several points in that description are not sufficiently detailed to permit perfect relationship. The exact condition of the anteroventral corner of the head is not clear, the third uropod is drawn from a lateral, not a dorsal view; but the third pleonal epimeron of the present species is much more broadly lobed posteriorly than in *B. japonica* and the seventh article of pereopod 5 is longer.

The very strong serrations on the rami of uropod 3 distinguish this species from *B. erythrops* Sars (see 1895) and *B. crassicornis* Metzger (see Sars, 1895); the large cuticular lenses differ from the small ones of *B. erythrops*; *B. crassicornis* lacks lenses.

### **Byblis tannerensis,** new species

(Figs. 5, 6)

*Byblis barbarensis* J. L. Barnard, 1960a: 34, fig. 11 (in part, station 5935).

*Diagnosis:* Antenna 1 exceeding peduncle of antenna 2 by length of article 5 of antenna 2; antenna 2 about as long as first 9 body segments; corneal lenses absent (holotype with calcareous concretion on left side of head, absent on right); front of head concave for insertion of antenna 1, rostrum moderately prominent, lateral cephalic lobe slightly pointed; anteroventral margin of head weakly oblique; pereopod 2 not elongated and enlarged like that of *Byblis lepta* (Giles); article 5 of pereopod 3 lacking posterior lobe; article 7 of pereopod 5 half as long as article 6; coxa 4 shallow; distolateral end of peduncle of uropod 2 with short falciform process; facing edges of rami of uropod 3 serrate; telson cleft almost halfway.

*Holotype:* AHF No. 605, ?male, 9.5 mm.

*Type locality:* Station 6833, Tanner Canyon, California, 32°-37′-54″N, 18°-58′-40″W, 813 m, January 29, 1960.

*Canyon material:* 3 specimens from the type locality.

*Basin material:* 5935, Catalina Basin (2) (identified as *B. barbarensis* in Barnard (1960a) and Hartman and Barnard (1960)).

*Relationship:* The antennae of this blind species are intermediate between those of *B. barbarensis* J. L. Barnard (1960a) and those of *B. crassicornis* Metzger (see Sars 1895: pl. 66, fig. 1). In *B. crassicornis* the first antenna is nearly as long as the second; in *B. barbarensis* it scarcely exceeds the peduncle of antenna 2. Article 7 of pereopod 5 is shorter than in either of the other species and coxa 4 is much more shallow. Margins of the rami of uropod 3 of *B. crassicornis* are almost smooth.

### Byblis veleronis J. L. Barnard

*Byblis veleronis* J. L. Barnard 1954b: 52-54, pls. 37-38.

*Canyon material:* 6803(2), 6804(?16), 6805(2), 6806(4), 6819 (1), 6846(1), 7728(1).

*Slope material:* 2227(5), 2344(1), 2423(1), 3031(2).

### Byblis spp.

*Material:* 5941(1), 6092(2), 6338(1), 6343 (1), 6809 (1).

### Haploops spinosa Shoemaker

(Figs. 7, 8)

*Haploops spinosa* Shoemaker 1931:13-18, figs. 5, 6.

*Haploops tubicola.*—J. L. Barnard 1960a: 35 (not Liljeborg in Sars 1895); ?Holmes 1908:518.

*Canyon material:* 4851(1).

*Remarks:* Barnard (1960a) overlooked the row of spines on the ventral margin of article 3 on pereopod 5 when he identified his specimens as *H. tubicola.*

*Other material:* 8 specimens from 3 stations.

*Distribution:* Formerly known from northwestern Atlantic Ocean, especially Nova Scotia, 0-2295 m. Recorded here from southern California, 88-171 m.

## Family AMPHILOCHIDAE

### Gitanopsis vilordes J. L. Barnard

*Gitanopsis vilordes* J. L. Barnard 1962c: 131-132, fig. 6.

*Canyon material:* 5505(1).

## Family AMPITHOIDAE

### Ampithoe ?mea Gurjanova

*Amphithoe* [sic] *mea* Gurjanova 1938: 361-364, fig. 53; Gurjanova 1951: 882-885, fig. 616.

*Material:* 4852(1), 6803(1).

*Remarks:* This species will be discussed in a forthcoming work by the writer on the genus *Ampithoe* of southern California.

## Family AORIDAE

### Acuminodeutopus heteruropus J. L. Barnard

*Acuminodeutopus heteruropus* J. L. Barnard 1959c: 29-30, pl. 7; J. L. Barnard 1961a: 179, fig. 1.

*Canyon material:* 4852(7).

### Aoroides columbiae Walker

*Aoroides columbiae* Walker 1898: 285, pl. 16, figs. 7-10; Thorsteinson 1941: 83-84, pl. 6, figs. 65-66; J. L. Barnard 1954a: 24-26, pl. 22; J. L. Barnard 1959c: 33; Nagata 1960: 175, pl. 16, fig. 94; J. L. Barnard 1961a: 180.

*Aoroides californica* Alderman 1936: 63-66, figs. 33-38.

*Canyon material:* 4852(195), 5505(?1), 6499(4), 6803(2), 6821(?1), 6835(?1), 7285(3).

### Microdeutopus schmitti Shoemaker

*Microdeutopus schmitti* Shoemaker 1942: 18-21, fig. 6; J. L. Barnard 1959c: 32-33, pl. 9; J. L. Barnard 1961a: 180.

*Canyon material:* 6805(1), 6806(3).

## Family ARGISSIDAE

### Argissa hamatipes (Norman)

*Argissa hamatipes* (Norman).—Stebbing 1906: 277; Shoemaker 1930: 37-40, figs. 15-16; Stephensen 1931a: 261; Stephensen 1935: 140; Stephensen 1940: 41; Stephensen 1944: 52; Gurjanova 1951: 327-328, fig. 193; J. L. Barnard 1962c: 151; Gurjanova 1962: 392-393.
*Argissa typica* Boeck.—Sars 1895: 141-142, pl. 48.

*Canyon material:* 6819(1).

## Family ATYLIDAE

### Atylus tridens (Alderman)

(Fig. 9)

*Nototropis tridens* Alderman 1936: 58-59, figs. 20-25.
*Atylus tridens* Mills 1961: 26-32, figs. 3, 4C.

*Canyon material:* 7043(1).

*Relationship:* This small specimen fits *Atylus serratus* (Schellenberg 1925) in Mills' (1961) key because the metasomal carinae are obsolete. It differs from *A. serratus* in various minor characteristics, such as the longer rostrum, the spination and setation of the appendages, the absence of a process on article 2 of pereopod 4, but especially in the very short fifth articles of pereopods 3-5 which are elongated in *A. serratus*. *Atylus tridens* differs from *A. swammerdami* (see Sars 1895: pl. 163) in these same ways. From *A. minikoi* (Walker 1905), *A. tridens* differs in the slightly produced posterodistal corner of article 2 on pereopod 3 (note damage on one side of animal), but especially in the absence of dorsal notches on urosomites 4 and 5-6 (fused). I am confused by Pillai's (1957) redescription of *A. minikoi* for it differs in many ways from the animal described by Walker (1905).

## Family COROPHIIDAE

### Ericthonius brasiliensis (Dana)

*Ericthonius brasiliensis* (Dana).—Stebbing 1906: 671-672; J. L. Barnard 1955a: 37-38 (with references); Pillai 1957: 60, fig. 16, 3-7; J. L. Barnard 1959c: 39; J. L. Barnard 1961a: 183.

*Canyon material:* 4851(1), 4852(4), 6803(1).

### Ericthonius ?difformis Milne Edwards

(Fig. 10)

*Ericthonius difformis* Milne Edwards.—Sars 1895: 604-605, pl. 216, fig. 1; Stebbing 1906: 672-673; Chevreux and Fage 1925: 354,

fig. 362; Dahl 1946: 6-8, figs. 4, 5; Gurjanova 1951: 950-951, fig. 661.

*Ericthonius hunteri* (Bate).—Sars 1895: 605, pl. 216, fig. 2; Stebbing 1906: 673; Holmes 1908: 543; Chevreux and Fage 1925: 354-356, fig. 363; Enequist 1950: 344-345, fig. 62; Gurjanova 1951: 951, fig. 662; Shoemaker 1955a: 68.

*Canyon material:* 6805(1), 6806(7), 6909(3).

*Remarks:* Schellenberg (1942), Dahl (1946) and Enequist (1950) have discussed whether *E. hunteri* (Bate) is the juvenile and therefore the junior synonym of *E. difformis.* A male specimen of 6909 has gnathopod 2 similar to the very advanced form shown by Enequist (1950, fig. 62) under the name *E. hunteri.*

## Family DEXAMINIDAE

### Dexamonica reduncans J. L. Barnard

*Dexamonica reduncans* J. L. Barnard 1958a: 130-132, pls. 26, 27.

*Canyon material:* 7038(4).

## Family GAMMARIDAE

### Ceradocus spinicaudus (Holmes)

*Maera spinicauda* Holmes 1908: 539-541, fig. 45.

*Ceradocus spinicauda.*—J. L. Barnard 1954a: 18-19; J. L. Barnard 1962b: 86-88, figs. 10, 11.

*Canyon material:* 6805(1), 6806(1).

### Maera danae (Stimpson)

*Maera danae* (Stimpson).—Shoemaker 1955a: 53-54 (with references).

*Maera loveni.*—J. L. Barnard 1962b: 103, fig. 19 (not Bruzelius).

*Canyon material:* 3179(2), 4851(30).

### Maera simile Stout

*Maera simile* Stout 1913: 644-645; Shoemaker 1942: 12; J. L. Barnard 1959c: 24-25, pl. 4; J. L. Barnard 1961a: 179.

*Maera inaequipes.*—J. L. Barnard 1954a: 16-18, pls. 16-17 (not Costa).

*Canyon material:* 6805(8), 6806(14).

### Megaluropus longimerus Schellenberg

*Megaluropus longimerus* Schellenberg.—J. L. Barnard 1962b: 103, figs. 20, 21.

*Canyon material:* 7031(1).

**Melita dentata** (Krøyer)

*Melita dentata* (Krøyer).—Sars 1895: 513-514, pl. 181, fig. 1; Gurjanova 1951: 749-750, fig. 518.

*Canyon material:* 5531 (1).

## Family HAUSTORIIDAE

**Urothoe varvarini** Gurjanova

*Urothoe varvarini* Gurjanova 1953: 219-221, figs. 3, 4; J. L. Barnard 1957; 82-84; Gurjanova 1962: 426-428, fig. 142.

*Canyon material:* 3166(1), 5960(2), 6803(6), 6805(3), 6806 (3), 6833 (?1+2), 6836(3), 6838(1), 7497(?1).

*Basin material:* 6348 (1).

*Slope material:* 2413(1), 2414(1), 3204(1).

## Family ISCHYROCERIDAE

**Bonnierella linearis californica**, new subspecies

(Fig. 11)

*Bonnierella linearis* J. L. Barnard 1964a: 42-43, fig. 33.

*Diagnosis:* Male gnathopod 1 conspicuously smaller than gnathopod 2, palm smooth; gnathopod 2 with posterior margin of article 6 shorter than palm, palm with 3 sharp or prominent cusps, that nearest dactylar hinge slightly bifid; apex of telson more rounded than in typical subspecies; article 2 of gnathopod 2 not produced distolaterally; apex of outer ramus on uropod 3 with very short knobs in contrast to elongated projections of typical subspecies; lateral cephalic lobe typically very sharp.

*Holotype:* AHF No. 608, male, 3 mm.

*Type locality:* Station 6348, Tanner Basin, 32°-37′-30″N, 119°-27′-50″W, 1292 m, August 16, 1959.

*Basin material:* The holotype and a female, 2.75 mm, from station 6339.

*Relationship:* This material bears closer relationship to *B. linearis* J. L. Barnard (1964a), described from Peru, than to other species in the genus and although several good differences are present I have decided to recognize them only at the infra-specific level. The female gnathopod of the new subspecies is more strongly ornamented on the palm than in *B. linearis linearis* but this may be a matter of age difference.

These specimens have very distinct epistomal processes, similar to the process of *B. lapisi* (J. L. Barnard 1962d) and probably indicate

that such were overlooked on other species of *Bonnierella*. However, *B. linearis* and *B. lapisi* both differ from other species in the genus in the small size of the male first gnathopods; this may be evidence of generic distinction.

Antennae and all pereopods are missing on the male holotype, but a few pereopods have been drawn from those remaining on the female specimen.

The mouthparts all resemble those drawn for *B. linearis linearis*.

### Ischyrocerus pelagops J. L. Barnard

*Ischyrocerus pelagops* J. L. Barnard 1962a: 56-58, fig. 25.

*Canyon material:* 4852(36). An unidentified specimen of *Ischyrocerus* was recorded at 6815.

## Family LILJEBORGIIDAE

### Liljeborgia cota J. L. Barnard

*Liljeborgia cota* J. L. Barnard 1962b: 83-86, figs. 8, 9.

*Slope material:* 2792(1), 7135(4).

*Canyon material:* 6497(1), 6832(3), 6833(1), 7154(1), 7288(3), 7289(2), 7290(2).

*Basin material:* 2335(1), 2729(1), 5933(1), 6338(1), 6339(1), 6347(1), 6348(1), 6351(1), 6828(1).

*Remarks:* Specimens from station 6832 represent an additional kind of aberrancy not noted by Barnard (1962b): all teeth of pleonites 1-5 are as large as the largest shown in Barnard's figure 8G.

### Genus Listriella J. L. Barnard, 1959a

In bathyal depths the five Californian species of this genus are difficult to distinguish. Like other amphipods descending into deeper waters they lose pigment in varying degrees and the eyes become reduced or lost. An aberrant form of *Listriella eriopisa* and forms of *L. goleta* are morphologically similar to the normally blind *L. albina*, also known from shallow water. In shallow water all of these taxa are clearly distinct because of pigmentary displays.

Numerous and clearly identifiable *L. albina* are present in the samples at hand. The specimens are characterized by lack of eyes, short antennae, greatly expanding sixth article of gnathopod 1, somewhat shortened outer ramus of uropod 3, and the presence of a palmar notch on gnathopod 2. Most nearly related to these is a specimen from 7289, bearing slight traces of eyes, equal rami of uropod 3 and short antennae. This I name *L. eriopisa*, aberrant form; it is simply a pigment-

less specimen. An individual from 4823 has well developed eyes but otherwise is like that of 7289. The next most nearly related is from 7845 and represents a normally pigmented *L. goleta* with shortened antennae. Next is a specimen from 6806 having eyes, no pigment, elongated antennae but long equal rami of uropod 3, which I assign to *L. goleta;* then follows a specimen from 5006 having pigment and characters of *L. goleta* but short equal rami of uropod 3. (Reexamination of shallow water *L. goleta* shows that individuals like that of 5006 are not uncommon.)

Finally, a remarkable specimen from 7288, apparently assignable to *L. albina*, bears immense third uropods with thickened inner rami but otherwise has the aspect of *L. eriopisa.*

### Listriella albina J. L. Barnard, giant form

(Fig. 12)

*Listriella albina* J. L. Barnard 1959a: 25-26, figs. 11, 12.

*Material:* Specimens all blind, pigmentless, having article 6 of gnathopod 1 characteristically expanding as grossly as shown in the original description.

*Remarks:* One giant male specimen (5.4 mm) from 7288 might be considered a blind specimen of *L. eriopisa* because of the greatly elongated inner ramus of the third uropod, but other features characteristic of *L. albina* remain: gnathopod 2, with its palmar notch, the strongly convex third pleonal epimeron, the equally long pereopods 4 and 5 and the elongated antennae. However, article 6 of gnathopod 1 is less trapezoidal than it is in shallow-water specimens.

*Canyon material:* 2148(1), 2190(3), 2191(9), 2317(1), 3000 (1), 5046(1), 6501(1), 6849(3), 6854(1), 6912(1), 6916(1), 7029 (2), 7285(1), 7288(1).

*Slope material:* 2362(1).

### Listriella eriopisa J. L. Barnard

*Listriella eriopisa* J. L. Barnard 1959a: 22-24, figs. 8-10.

*Canyon material:* 2191(1), 2192(4), 3180(1), 4846(1), 5367(1), 6845(1), 6854(1), 7029(1), 7030(2), 7038(2), 7284(2), 7285(1), 7289(1), 7730(1).

*Slope material:* 5616(2).

*Remarks:* Three forms of this species are now apparent: (1), the normally pigmented form with unequal rami of uropod 3; (2), the normally pigmented form with equal rami of uropod 3; and (3), an unpigmented form with equal rami of uropod 3; eyes of the latter often are obsolescent.

### Listriella goleta J. L. Barnard

*Listriella goleta* J. L. Barnard 1959a: 20-22, figs. 5-7.

*Material:* Normal form with elongated antennae and pigment, but some specimens having rami of uropod 3 equal, others unequal:

*Canyon material:* 3166(1), 5006(9), 5367(15), 6498(1), 6804(1), 6806(1), 7030(8), 7038(1), 7044(10), 7284(1).

*Slope material:* 5616(4), depth 72-459 m.

Form with shortened antennae and reduced pigment:

*Canyon material:* 2192(2), 5505(1), 7845(1), depth 113-374 m.

### Listriella melanica J. L. Barnard

*Listriella melanica* J. L. Barnard 1959a: 16-18, figs. 1, 2.

*Canyon material:* 4852(7).

## Family LYSIANASSIDAE

### Acidostoma hancocki Hurley

(Fig. 13)

*Acidostoma hancocki* Hurley 1963: 37-40, figs. 9, 10.

*Canyon material:* 6837 (juvenile 1.8 mm), 7174(1), 7403(1).

*Remarks:* Figures of pereopods, uropod 2 and maxilla 1 are given to supplement Hurley's fine portrayal of this species. The small first maxillary palp is distinct on this small specimen and the peduncle of uropod 2 is not as strongly expanded as it is in the adult stage.

### Anonyx carinatus (Holmes)

*Lakota carinata* Holmes 1908: 498-500, fig. 9; Thorsteinson 1941: 56, pl. 2, figs. 16, 17; Gurjanova 1962: 302-303, fig. 100.

*Anonyx carinatus*.—Hurley 1963: 103-108, figs. 32-34.

*Canyon material:* 6845(1), 6846(1).

*Slope material:* 2447(1).

### Hippomedon denticulatus (Bate)

*Hippomedon denticulatus* (Bate).—Sars 1895: 56-57, pl. 20; Stebbing 1906: 59; Chevreux and Fage 1925: 53-54, fig. 37; Gurjanova 1951: 233-234, fig. 96; Gurjanova 1962: 106, fig. 23 only.

*Canyon material:* 6845 (4).

### Hippomedon tenax, new species

(Fig. 14)

*Diagnosis:* Third pleonal epimeron with nearly straight posterior margin, ventral corner with almost symmetrically tapering, medium-sized, acute posterior tooth, scarcely upturned; other pleonal epimera rounded

or quadrate posteriorly; pleonite 4 rounded dorsally; telson medium in length, cleft more than halfway, apices tapering, each armed with a spine; eyes absent; articles 5 and 6 of gnathopod 1 equal in length, palm oblique, distinct from posterior margin of article 6; mandibular palp article 3 about three fourths as long as article 2; article 2 of pereopod 5 not constricted distally; coxae lacking conspicuous teeth; article 1 of antenna 1 not produced distally, article 1 of flagellum elongated; outer ramus of uropod 3 apparently biarticulate; lateral cephalic lobes short; gnathopod 2 short, stout.

*Holotype:* AHF No. 5811, male, 4 mm. Unique.

*Type locality:* Station 5829, off Ventura, California, 34°-10′-55″ N, 119°-25′-45″W, 88 m, August 21, 1958.

*Relationship:* This species most closely resembles *Hippomedon geelongi* Stebbing (1888: pl. 11) but differs in the shorter cephalic lobes and stouter second gnathopod. It differs from *H. minusculus* (Gurjanova, see 1962) in the elongated basal flagellar article of antenna 1. It is remarkably similar to *H. propinquus eous* Gurjanova (1962) but that subspecies has a shorter sixth article of gnathopod 1 and bears distinct eyes.

*Hippomedon granulosus* Bulycheva (1955, see Gurjanova 1962) differs from this species in the shorter sixth article of gnathopod 1 but otherwise there is close correspondence. *Hippomedon strages* J. L. Barnard (1964a) differs from *H. tenax* in the same way as *H. granulosus*; in addition the palm of gnathopod 1 is longer than the posterior margin of article 6.

This specimen bears resemblance to *Tryphosa coeca* Holmes (1908) from Monterey Bay. Unlike the figures of *T. coeca* it has a much stouter second gnathopod, slightly longer first gnathopod and larger tooth of the third pleonal epimeron. Holmes did not figure the head, coxa 4, and other characters of his species.

### Hirondellea fidenter, new species

(Figs. 15, 16)

*Diagnosis:* Eyes not apparent; article 7 of gnathopod 1 greatly overlapping palm; third pleonal epimeron broadly convex posteriorly, ventral corner rounded; fourth pleonite not strongly produced dorsally; inner ramus of uropod 2 strongly constricted; telson long, deeply cleft.

*Holotype:* AHF No. 5919, male, 4.7 mm. Unique.

*Type locality:* Station 6336, San Nicolas Basin, California, 33°-09′-00″N, 118°52′-10″W, 1227 m, August 14, 1959.

*Relationship:* Of the six species described since the erection of the

genus, *Hirondellea fidenter* resembles the type more than it does the others. In its long and deeply cleft telson, it is especially similar to *Hirondellea trioculata* Chevreux (see 1900), but it differs from that species in the strongly overlapping dactyl of gnathopod 1 and the broadly rounded posterior edge of the third pleonal epimeron. From *H. gigas* (Birstein & Vinogradov 1955) it differs in the narrower, more deeply cleft telson, the narrower rami of uropod 3 and the broadly rounded posterior edge of the third pleonal epimeron. The genus *Hirondellea* includes species having the inner ramus of uropod 2 constricted or not constricted, the present species having that constriction.

## Genus **Lepidepecreella** Schellenberg

*Lepidepecreella* Schellenberg 1926: 281.

Including the one described here, six species are known for this genus. With one or possibly two exceptions, their interspecific differences are rather minor, at best quantitative, and somewhat suggestive of the situation in presumably pelagic and semiparasitic genera such as *Trischizostoma*, reviewed by J. L. Barnard (1961b). *Lepidepecreella bidens* (K. H. Barnard 1930) is that member most distinct from the type-species, *L. ctenophora* Schellenberg (1926), differing from it by the presence of a nasiform process on article 2 of pereopod 3. *Lepidepecreella ovalis* K. H. Barnard (1932) was stated to have its rostrum extending as far as the epistomal process, hence differing from all other species. The remaining species, *L. emarginata* Nicholls (1938), *L. cymba* (Goës, see Stephensen 1931b), *L. ctenophora,* and the following new species differ among themselves in minor characters as seen in the following key. They may represent races or ecophenotypes of a polymorphic species.

### Key to Species of **Lepidepecreella**

1. Article 2 of pereopod 3 with posterodistal nasiform process ........ *bidens*
1. Article 2 of pereopod 3 rectangular, linear ........ 2
2. Telson emarginate, articles 5 and 6 of gnathopod 1 subequal ........ *emarginata*
2. Telson convex, article 6 of gnathopod 1 longer than article 5 ........ 3
3. Rostrum extending to apex of epistomal process, third pleonal epimeron with distinct posteroventral tooth ........ *ovalis*

3. Rostrum very short, third pleonal epimeron lacking distinct posteroventral tooth, posterior edge serrate ........ 4
4. Posterior lobe on article 4 of pereopod 3 half as long as article 5........ *charno*, n. sp.
4. Posterior lobe on article 4 of pereopod 3 as long as article 5 ........ 5
5. Epistome marked ventrally with distinct notch, coxa 5 broader than coxa 6 ........ *cymba*
5. Epistome not marked ventrally with distinct notch, coxa 5 narrower than coxa 6 ........ *ctenophora*

### **Lepidepecreella charno**, new species

(Fig. 17)

*Diagnosis:* Rostrum short; article 6 of gnathopod 1 longer than article 5; epistome not marked ventrally with notch; posterior lobe of article 4 on pereopods 3 and 4 only half as long as article 5, this lobe on pereopod 5 as long as article 5; coxa 5 broader than coxa 6; third pleonal epimeron with serrate posterior edge, lacking distinct tooth at posteroventral corner; telson evenly convex apically.

*Holotype:* AHF No. 5911, female, 4.5 mm. Unique.

*Type locality:* Station 6091, San Clemente Basin, off Baja California, 32°10′30″ N, 117°57′10″ W, 1895 m, January 14, 1959.

*Relationship:* Differing from both *L. cymba* and *L. ctenophora* in the short posterior lobe of article 4 on pereopod 3, from *L. ctenophora* by the broad coxa 5 which in that species is narrower than coxa 6, from *L. emarginata* in the convex telson and long sixth article of gnathopod 1, from *L. ovalis* in the short rostrum and lack of a tooth on the third pleonal epimeron and from *L. bidens* in the linear, unproduced second article of pereopod 3.

### **Lysianassa holmesi** (J. L. Barnard), new combination

*Aruga holmesi.*—J. L. Barnard 1955b: 100, pls. 27-28; J. L. Barnard 1959c: 18; Gurjanova 1962: 299-301, figs. 98-99.

*Canyon material:* 3385(11).

*Slope material:* 2789(1).

### **Lysianassa oculata** (Holmes), new combination

*Aruga oculata* Holmes 1908: 505-507, figs. 14-15.

*Lysianopsis oculata.*—Hurley 1963: 74, fig. 21c (with references).

*Canyon material:* 4852(1), 5367(3), 6846(2).

### **Opisa tridentata** Hurley

*Opisa tridentata* Hurley 1963: 26-30, figs. 4, 5.

*Canyon material:* 5960(2).

### **Orchomene decipiens** Hurley, new combination

*Orchomenella decipiens* Hurley 1963: 127-130, figs. 43, 44.

*Canyon material:* 2192(1), 4846(1), 4851(2), 5114(4), 5676(1), 6780(1), 6781(17), 6845(4), 6846(1), 7038(1), 7047(1), 7174(1), 7284(4).

*Slope material:* 2789(2).

### **Orchomene pacifica** Gurjanova, new combination

*Orchomenella pacifica* Gurjanova 1938: 252-254, fig. 3; Gurjanova 1951: 287, fig. 155; Gurjanova 1962: 174-177, figs. 52, 53.

*Canyon material:* 7038(5), 7044(1).

*Slope material:* 2843(1).

### **Pachynus barnardi** Hurley

*Pachynus barnardi* Hurley 1963: 31-35, figs. 6, 7.

*Canyon material:* 3385(2), 4851(1), 5367(1), 5960(4), 6499(1), 6835(1), 6845(2), 6898(1), 6909(1), 7029(1), 7054(1), 7174(1).

*Slope material:* 2361(1).

### **Prachynella lodo** J. L. Barnard

*Prachynella lodo* J. L. Barnard 1964b: 233, fig. 7.

*Canyon material:* 6804(1), 6822(2), 7038(2), 7044(1).

### **Pseudokoroga rima** J. L. Barnard

*Pseudokoroga rima* J. L. Barnard 1964c: 95-99, figs. 14-17.

*Canyon material:* 4852(2).

### **Schisturella** Norman

*Schisturella* Norman 1900: 208

*Diagnosis:* Mouthparts arranged in a quadrate bundle; mandible with a distinct, non-dentate cutting edge, strongly triturate molar, palp attached level with molar; maxilla 1 with biarticulate palp; gnathopod 1 subchelate or nearly simple; telson cleft more than one-fourth of its length; coxa 1 very small, largely hidden by coxa 2, about half as long as article 2 of gnathopod 1; branchiae pleated on one side; upper lip lobately produced in front of epistome; inner ramus of uropod 2 with deep marginal incision.

*Type species: Tryphosa pulchra* Hansen.

*Remarks:* Both Dahl (1959) and J. L. Barnard (1961b) have discussed or given keys to the ambasialike lysianassid genera. Barnard erred in his assignment of *Ambasiopsis robustus*, which should be transferred to *Schisturella* (=*S. robusta* (Barnard)). Dahl's *Schisturella galatheae* should be transferred to *Neoambasia*, temporarily. That species has a long first coxa and lacks a notch on the inner ramus of uropod 2. Dahl's species differs from *N. tumicornis* by the well-developed spines on the outer plate of maxilla 1.

*Schisturella* is also characterized by a short, subconical, posterior process on the third article of antenna 2, which in one new species to follow is obsolescent.

*Lakota rotundata* (K. H. Barnard, see J. L. Barnard 1962d) keys to *Neoambasia* but it differs from that genus as does *S. galatheae* in the well-developed spines on the outer plate of maxilla 1 and in the constriction on the inner ramus of uropod 2. I retain that species in *Lakota* (=*Anonyx*) but one must note its transition to *Neoambasia* and the probability that it is a member of the genus *Pseudonesimus* Chevreux. The latter genus may be synonymous with *Schisturella.*

*Chironesimus* has been fused with *Anonyx* by Gurjanova (1962) and the genus *Lakota* Holmes revived to include *C. rotundata.* As noted elsewhere, this is a course difficult to put into practice. Hurley (1963) has wisely included *Lakota* with *Anonyx.*

## Key to Species of **Schisturella**

1. Third pleonal epimeron with tooth at posteroventral corner .......... 2
1. Third pleonal epimeron rounded-quadrate posteriorly .......... 3
2. Eyes present, palm of gnathopod 1 very oblique, obsolescent .......... *cocula*, n. sp.
2. Eyes absent, palm of gnathopod 1 transverse .......... *zopa*, n. sp.
3. Palm of gnathopod 1 subtransverse, distinct from posterior margin of article 6, eyes absent .......... *robusta*
3. Palm of gnathopod 1 very oblique, barely distinct from posterior margin of article 6, eyes present .......... *pulchra*

*Ambasiopsis robustus* J. L. Barnard (1961b) is removed to *Schisturella,* becoming *S. robusta* (Barnard).

*Schisturella galatheae* Dahl (1959) is removed to *Neoambasia.*

### **Schisturella cocula,** new species

(Figs. 18, 19)

*Diagnosis:* Third pleonal epimeron with posteroventral tooth; palm of gnathopod 1 scarcely distinct from posterior margin of article 6; lobe of upper lip tapering; eyes present.

*Holotype:* AHF No. 589, male, 6.7 mm. Unique.

*Type locality:* Station 5996, off Pt. Conception, California, 34°-23′-05″ N, 120°-26′-45″ W, 162 m, December 16, 1958.

*Remarks:* Tubular accessory gills are present on coxae 5 and 6.

### **Schisturella zopa,** new species

(Fig. 20)

*Diagnosis:* Third pleonal epimeron with a tooth at the posteroventral corner; palm of gnathopod 1 transverse; lobe of upper lip tapering; eyes absent.

*Holotype:* AHF No. 5413, ?male, 2.9 mm. Unique.

*Type locality:* Station 2847, Catalina Canyon, 33°-22′-30″N, 118°-36′-38″W, 914 m, June 23, 1954.

*Remarks:* Gills were not satisfactorily analyzed. The process on the third peduncular article of antenna 2 is obsolescent. An aesthetasc but not a spine is present on the distal end of article 1 of the first antennal flagellum.

### **Sophrosyne robertsoni** Stebbing and Robertson

(Figs. 21, 22)

*Sophrosyne robertsoni* Stebbing and Robertson 1891: 31-34, pl. 5A; Stebbing 1906: 21-22.

*Basin material:* 6832(2), Tanner Basin, 1298 m.

*Remarks:* The crucial identifying characters of this species, forming a combination distinct from the other two species of the genus, *S. hispana* (Chevreux) and *S. murrayi* Stebbing, are as follows: the shape of gnathopod 2, the furnishment of its palm with tasseled setal bundles, the shape of the third pleonal epimeron with a narrow but long posterior tooth, the dorsal configuration and lateral ridges of urosomite 1, the poor ventral extension of article 2 on pereopod 5, and the short cleft of the telson. Dim brownish-purple lateral spots may form the vestigial eyes, although Stebbing and Robertson did not perceive eyes. This is the first record of this strange genus since the original descriptions of the three species in 1887, 1888 and 1891.

### **Thrombasia,** new genus

*Diagnosis:* Basal articles of both flagella on antenna 1 elongated; upper lip very strongly lobate in front; molar of mandible rather weak,

palp attached level with molar, article 3 about 70 percent as long as article 2; inner plate of maxilla 1 with 2 apical setae, outer plate with long, well-developed spines; lobes of maxilla 2 not gaping, similar in shape; outer plate of maxilliped with small, imbedded medial spines, apex with 2 large spines; gnathopods 1 and 2 with transverse palms; coxa 1 not greatly shortened, triangular, as long as article 2 of gnathopod 1, partially hidden by coxa 2; inner ramus of uropod 2 incised; uropod 3 with biarticulate outer ramus; telson cleft halfway.

*Type species: Thrombasia tracalero*, new species.

*Relationship:* According to the review of ambasia genera by Dahl (1959), this genus comes close to *Neoambasia* Dahl (1959) (type *Ambasiopsis tumicornis* Nicholls 1938); but considering the degree to which ambasia genera have been fragmented and the numerous weakly developed characters distinguishing the present species from *N. tumicornis*, it becomes necessary to erect still another monotypic genus to receive it. From *Neoambasia* the new genus differs in the much more strongly produced upper lip, the elongated basal articles on both flagella of antenna 1, the weakly developed mandibular molar, the well-developed spines on the outer plate of maxilla 1, and the constriction on the inner ramus of uropod 2. The long first coxa distinguishes the genus from *Ambasia, Schisturella,* and *Metambasia;* the subchelate first gnathopod, produced labrum and mandibular palp location distinguish it from *Ambasiella;* the presence of spines on the outer plate of the maxilliped and the weak mandibular molar distinguish the genus from *Ambasiopsis.*

## Thrombasia tracalero, new species

(Figs. 23, 24)

*Diagnosis:* With the characters of the genus.

*Description:* Eyes absent; lateral cephalic lobes stongly projecting and subacute; second pleonal epimeron slightly produced at posteroventral corner; third pleonal epimeron with large but not elongated posterior tooth.

*Holotype:* AHF No. 5414, male, 4.5 mm. Unique.

*Type locality:* Station 2789, slope of Santa Monica Basin, 33°-49′-59″N, 118°-34′-05″W, 167 m, May 22, 1954.

## Tryphosa index, new species

(Fig. 25)

*Diagnosis:* Lateral cephalic lobes large, strongly projecting, subacute apically, eyes pale straw-colored in alcohol, large, composed of numerous hexagonal cells; epistome large, broadly rounded in front;

third pleonal epimeron with straight, unserrated posterior edge and small tooth at ventral corner; urosomite 1 with upright acute carina. Mouthparts like *T. sarsi* (= *T. nana* Sars 1895: pl. 27, fig. 1) except outer plate of maxilliped as shown herein. Branchiae attached to coxae 5 and 6, each with a tubular accessory gill.

*Holotype:* AHF No. 604, male, 6.5 mm. Unique.

*Type locality:* Station 6840, San Clemente Rift Valley, 32°-44′-35″N, 118°-12′-43″W, 1620 m, January 30, 1960.

*Relationship:* Closely related to *T. trigonica* (Stebbing 1888: pl. 9) but differing from it in the presence of faint eyes, in the tooth of third pleonal epimeron being smaller and more distinctly separated from the posterior margin, and in the posterior lobe of pereopod 5 being narrowed distally. The new species may prove to be a race of *T. trigonica.*

*Tryphosa propinqua* Chevreux (1926) is similar to *T. index* but its epistome is less strongly produced and the cephalic lobes are apically rounded, not subacute.

### **Uristes californicus** Hurley

*Uristes californicus* Hurley 1963: 91-96, figs. 27-29.

*Canyon material:* 6836(2).

## Family MELPHIDIPPIDAE

### **Melphidippa (?) amorita, new species**

(Fig. 26)

*Description:* This specimen has the aspect of a melphidippid but its two most important parts, the antennae and uropod 3, are missing. It cannot be firmly relegated to the Melphidippidae and, because of the telson, it cannot be assigned to *Melphidippa;* until its missing parts are discovered, the species is of provisional assignment.

Characters relating it to Melphidippidae: eyes bulging; coxae very short, but unlike other melphidippids the last three coxae are not bilobed; mouthparts all like *Melphidippa;* gnathopods and pereopods elongated, gnathopods slender and poorly subchelate; pleonites 1-5 each with a long dorsal tooth, marginal serrations present on pleonal epimera 1-4; uropods 1-2 elongated and with shortened outer rami.

Telson rather short, the short cleft forming gaped bilateral, acute lobes, not characteristic of other melphidippids.

*Holotype:* AHF No. 6012, female, 6.4 mm. Unique.

*Type locality:* Station 6836, Tanner Canyon, 32°-36′-00″N, 119°-05′-18″W, 496 m, January 29, 1960.

### Melphisana bola J. L. Barnard

*Melphisana bola* J. L. Barnard 1962b: 81-83, fig. 7.

*Canyon material:* 7031 (1).

## Family OEDICEROTIDAE

### Bathymedon covilhani J. L. Barnard

(Fig. 27)

*Bathymedon covilhani* J. L. Barnard 1961b: 85, fig. 53.

*Canyon material:* 6820 (1), 6831 (1).

*Basin material:* 6344 (1), 6810 (1).

*Remarks:* Although the epistome appears to be somewhat more produced than in the Panamanian type specimen, the gnathopods, telson, head and pereopod 3 relate the present specimens to the original material. The retention of antenna 1, missing in the type specimen, permits its description: article 3 is as long as article 2 and longer than article 1. This discovery shows the relationship of *B. covilhani* to *B. gorneri* Gurjanova (1951). The two species may prove to be either identical or races of a single stem. Gurjanova's Bering Sea species should be examined for the condition of its epistome. In comparison to *B. gorneri*, *Bathymedon covilhani* has more strongly notched distal ends of article 5 on the gnathopods, a less projecting mandibular molar, a more slender first mandibular palp article, a shorter fourth article of the maxillipedal palp, and a convexly projecting telsonic apex.

### Bathymedon kassites, new species

(Fig. 28)

*Diagnosis:* Eyes practically obsolete, formed of granular material in the rostrum and dorsal cephalon, rostrum very small, anterior edge of head below antennal corner nearly vertical; articles 5 and 6 of gnathopods subequal in length; posterior lobes on fifth articles of gnathopods strongly projecting, lobe on gnathopod 2 sharper, palms longer than posterior margins of sixth articles; peduncle of antenna 1 intermediate in length between that of *B. candidus* and that of *B. palpalis* (see J. L. Barnard 1961b), article 3 much shorter than article 1; coxa 1 produced forward but not greatly; pereopods 3-4 with article 2 slender; pleonite 4 unarmed; telson apically rounded, bearing two very stout spines.

*Holotype:* AHF No. 5918, female, 3.2 mm.

*Type locality:* Station 6494, Monterey Canyon, California, 36°-46′-58″ N, 121°-55′-56″W, 750 m, October 3, 1959.

*Canyon material:* 6490 (1), 6494 (7).

*Relationship:* This species resembles *B. candidus* J. L. Barnard

(1961b) in the nearly vertical cephalic margin below the antennal corner and the long palms of the gnathopods, but differs in the longer posterior lobes on the fifth articles of the gnathopods and in the armament of the telson being composed of two stout spines, instead of several slender setae. It is related to *B. ivanovi* Gurjanova (1952) but differs in the stoutness of the telsonic spines and the longer posterior lobes on the fifth articles of the gnathopods.

From *B. palpalis* K. H. Barnard (1916, and see J. L. Barnard 1961b) this species differs in the rounded, not emarginate telson, but has the two stout spines typical of *B. palpalis*. Antenna 1 of the new species is slightly shorter, the first coxa is less strongly produced forward and the posterior lobe of article 5 on gnathopod 2 is larger than in *B. palpalis*.

### Bathymedon roquedo J. L. Barnard

*Bathymedon roquedo* J. L. Barnard 1962e: 354, fig. 2.

*Canyon material:* 2725(1).

### Monoculodes emarginatus J. L. Barnard

*Monoculodes emarginatus* J. L. Barnard 1962e: 361-363, fig. 4.

*Canyon material:* 6845(2).

### Monoculodes glyconicus J. L. Barnard

*Monoculodes glyconica* J. L. Barnard 1962e: 363, fig. 5.

*Canyon material:* 7288(1).

*Slope material:* 2843(3).

### Monoculodes hartmanae J. L. Barnard

*Monoculodes hartmanae* J. L. Barnard 1962e: 363-365, figs. 5-7.

*Canyon material:* 4852(1), 7031(2), 7044(1).

### Monoculodes latissimanus Stephensen

(Fig. 29)

*Monoculodes latissimanus* Stephensen 1931a: 244-245, fig. 70; Gurjanova 1951: 585, fig. 392.

*Canyon material:* 2190(1), 6819(4).

*Remarks:* These specimens, although as badly broken as the type or more so, mostly lacking ends of pereopods, antennae and uropods, fit Stephensen's description in gnathopods, telson, and head, although the rostrum is slightly longer. In this regard they call attention to the even closer relationship between *M. latissimanus* and *M. abacus* J. L. Barnard (1961b) than that noted by Barnard, although the telson remains distinctive for *M. latissimanus*. It may prove necessary to regard these species as races, thereby demonstrating a common distribution of

bathyal forms as widely separated as the north Atlantic and the Tasman Sea.

### Monoculodes norvegicus (Boeck)

*Monoculodes norvegicus* (Boeck).—Sars 1895: 301-302, pl. 107, fig. 1; Stebbing 1906: 265-266; Shoemaker 1930: 67; Stephensen 1931a: 247; Stephensen 1938: 228-229; Stephensen 1940: 39; Gurjanova 1951: 582-583, fig. 389; J. L. Barnard 1962e: 367.

*Canyon material:* 7044(1), 7728(1).

*Basin material:* 2439(1).

### Monoculodes perditus, new species

(Fig. 30)

*Diagnosis:* Rostrum medium in length, slightly deflexed, reaching end of article 1 of antenna 1, tapering acutely; lateral cephalic lobes short, obtuse; eye(s) very pale; largely located on rostrum, anterior edge of eyes about one third back on rostrum; dactyls of pereopods 1 and 2 as long as sixth articles; coxa 4 with straight, unproduced posterior margin; gnathopods stout, palm of gnathopod 1 longer than posterior margin of article 6, article 5 with stout, medium-sized lobe; article 6 of gnathopod 2 intermediate between slender and stout, palm and posterior margin of article 6 subequal, article 5 with posterior lobe of medium length and slenderness, reaching to defining corner of palm and facing posterior edge of article 6; all pleonal epimera rounded at corner; telson slightly emarginate distally.

*Notes:* Head of larger male damaged and restored as accurately as possible in the drawing; head of holotype undamaged as drawn; only one fifth pereopod is present and it probably has abnormally stunted articles 5-7.

*Holotype:* AHF No. 6014, male, 2.9 mm.

*Type locality:* Station 6845, Coronado Canyon, California, 32°-30′-16″N, 117°-16′-50″W, 177 m, February 1, 1960.

*Material:* 2 specimens from the type locality.

*Relationship:* This species differs from *M. coecus* Gurjanova (see 1951) in the much stouter articles 5 and 6 of gnathopod 2. From *M. diamesus* Gurjanova (see 1951), *M. perditus* differs in the non-acute, obtuse, lateral cephalic lobe, the larger lobe of article 5 of gnathopod 1, the shorter posterior margin of article 6 of gnathopod 1, and the longer posterior lobe of article 5 on gnathopod 2. From *M. minutus* Gurjanova it differs in the emarginate telson and shorter posterior lobe of article 5 on gnathopod 1. *M. perditus* bears resemblance to *M. latimanus* (Goës) (see Sars 1895: pl. 108) but differs in the much longer dactyls of pereopods 1 and 2 and the emarginate telson.

### Oediceropsis (Paroediceroides) Schellenberg, 1931

*Paroediceroides*, as stated by J. L. Barnard (1961b), is closely related to *Oediceroides* Stebbing, differing mainly in the posteriorly produced coxa 4; in this regard it is also related to some species of *Monoculodes* Stimpson, that genus intergrading with *Oediceroides* in the configurations of the gnathopods. In addition, *Paroediceroides trepadora* Barnard (1961b) has affinities with *Oediceropsis* Liljeborg (see Sars 1895: pl. 114). Barnard (1961b) erred in his key to the Oedicerotidae, as *Oediceropsis* does possess a posteriorly produced coxa 4. Barnard mentioned that the mouthparts of *P. trepadora* were like those of *Oediceropis*. That genus has been described as having lateral eyes; Schellenberg (1931) described *Paroediceroides* as having eyes fully fused. *Pareoediceroides trepadora* lacks eyes, and might be assigned to either genus. *Paroediceroides* should be reduced to subgeneric status under *Oediceropsis;* by disregarding eyes, the subgeneric differences may be denoted as the presence of a swollen first article of antenna 2 in *Oediceropsis* and a small unswollen first article in *Paroediceroides*.

### Oediceropsis (Paroediceroides) elsula, new species

(Fig. 31)

*Diagnosis:* Rostrum very short, reaching about a third of the way along article 1 of antenna 1; lateral cephalic lobes exceeding rostrum in forward extent, rounded; eyes absent; posterior lobe of article 5 of gnathopod 1 short and blunt; telson truncated; coxa 1 with rounded anteroventral corner; process of coxa 4 blunt. Uropod 3 missing.

*Holotype:* AHF No. 6015, female, 3.6 mm. Unique.

*Type locality:* Station 6837, Tanner Canyon, California, 32°-34′-36″N, 119°-02′-48″ W, 644 m, January 29, 1960.

*Relationship:* This species differs from *Oediceropsis trepadora* (J. L. Barnard 1961b) and *O. morosa*, n. sp., in the very short rostrum. It differs from *Oediceropsis brevicornis* Liljeborg (see Sars 1895: pl. 114) in the lack of eyes, the unswollen first article of antenna 2 (a subgeneric difference) and the longer first antenna.

*Oediceropsis proxima* Chevreux (1908) also lacks eyes. The new species may not be distinct from *O. proxima* although coxa 4 is bluntly and not acutely produced and the posterior lobe of article 5 on gnathopod 2 is shorter and blunter.

*Oediceropsis sinuata* Schellenberg (1931) has fused eyes and an emarginate telson, among other characters of distinction.

**Oediceropsis (Paroediceroides) morosa, new species**

(Fig. 32)

*Diagnosis:* Rostrum slender, acute, reaching two thirds along article 1 of antenna 1; lateral cephalic lobes not projecting as far forward as rostrum, subacute; eyes absent; posterior lobes of fifth articles of gnathopods projecting but only moderately slender; pereopods 1 and 2 with very slender articles; telson truncated; coxa 1 with truncated anteroventral corner; coxa 4 with posterior process blunt. Uropod 3 missing. Mouthparts like *Oediceroides rostrata* (Stebbing 1888: pls. 60, 61, as *O. conspicua*) but inner lobe of maxilla 1 with only 2 setae.

*Holotype:* AHF No. 6016, female, 5.5 mm. Unique.

*Type locality:* Station 6833, Tanner Canyon, 32°-37′-54″N, 118°-58′-40″W, 813 m, January 29, 1960.

*Relationship:* This species differs from *Oediceropsis trepadora* (J. L. Barnard 1961b) in the anteriorly truncate first coxa.

**Oediceropsis (Paroediceroides) trepadora (J. L. Barnard), new combination**

(Fig. 33)

*Paroediceroides trepadora* J. L. Barnard 1961b: 96, fig. 64.

*Material:* 6839, male, 5.0 mm.

*Remarks:* This specimen corresponds to that figured by Barnard in all characters except pereopod 4 which has a more slender article 2. From lateral view the cephalic lobe seems sharper but further rotation of the head shows that the lobe fits the figure of Barnard; it is shown herein in a subsidiary figure.

Mouthparts are like those of *Oediceropsis brevicornis* Liljeborg (Sars 1895: pl. 114).

**Synchelidium sp. G, var.**

*Canyon material:* 5006(1), 6803(15).

**Synchelidium rectipalmum Mills**

*Synchelidium rectipalmum* Mills 1962a: 17-19, figs. 5, 6B.

*Canyon material:* 4852(6).

**Synchelidium shoemakeri Mills**

*Synchelidium shoemakeri* Mills 1962a: 15-17, figs. 4, 6A.

*Canyon material:* 4852(9), 6499(1).

**Synchelidium spp.**

*Canyon material:* 6835(2), 7031(1), 7039(1).

**Westwoodilla caecula forma acutifrons Sars**

*Halimedon Mülleri* Boeck.—Sars 1895: 327-329, pl. 115.

*Westwoodilla caecula* (Bate).—Enequist 1950: 333-338, figs. 40-56; Gurjanova 1951: 541-543, fig. 357: (*coecula, sic*); Mills 1962a: 5-9, figs. 1, 6A.

*Halimedon acutifrons* Sars 1895: 329-330, pl. 116, fig. 1.

*Canyon material:* 5960(11), 6821(1), 6845(9), 6846(1), 7043(1), 7174(2), 7285(1). An unidentifiable specimen of *Westwoodilla* was collected at basin station 2439.

*Slope material:* 2789(5), 3204(7).

## Family PARDALISCIDAE

**Nicippe tumida Bruzelius**

*Nicippe tumida* Bruzelius.—Sars 1895: 410-411, pl. 144, pl. 145, fig. 1; Stephensen 1931a: 215-216, chart 38; Enequist 1950: 325-326, figs. 14, 15; Gurjanova 1951: 509-510, fig. 333; J. L. Barnard 1959b: 39-40, figs. 1, 2.

*Canyon material:* 4851(4), 5505(2), 6845(4), 6849(1), 6854(8), 7039(1), 7174(14), 7285(2).

*Basin material:* 5929(1), 6828(1).

*Slope material:* 2789(1).

**Pardaliscella symmetrica J. L. Barnard**

*Pardaliscella symmetrica* J. L. Barnard 1959b: 40-42, figs. 3, 4.

*Canyon material:* 6837(1), 6845(1), 7038(1).

*Basin material:* 5933(1), 6340(?1), 6341(?1).

**Pardaliscoides (?) fictotelson, new species**

(Fig. 34)

*Diagnosis:* Telson cleft about one-fourth of its length, most of the cleft formed by a deep and broad terminal emargination separating telsonic apices broadly, remainder of cleft very narrow and forming a short incision, each apex of telson with at least one long seta; rami of uropod 3 subfoliaceous and not more than twice as long as peduncle; each pleonal epimeron with a tooth at posteroventral corner, tooth of second epimeron longest; urosomites 1 and 2 each with a posterodorsal crestlike tooth.

*Holotype:* AHF No. 5921, male, 2.7 mm.

*Type locality:* Station 6805, Santa Cruz Canyon, 33°-56′-03″N, 119°-52′-03″W, 218 m, December 22, 1959.

*Material:* Three specimens from the type locality.

*Relationship:* This species differs from the type species, *P. tenellus* Stebbing (see 1897), in its poorly cleft, basally united telson with gaping apices; in *P. tenellus* the telson is very deeply cleft with gaping apices; the mouthparts are similar to those shown by Stebbing and the first antenna fits the generic definition, having article 2 longer than article 1. The second maxillary lobes appear slightly more narrow and the inner lobe of the second maxilla is more weakly developed in the present specimen. It is in poor condition, for pereopods 3 and 5 are missing, and uropods 1 and 2, the antennae, and the head are damaged.

The new species differs from *P. longicaudatus* Dahl (1959) in the short rami of uropod 3 and in the slightly projecting posteroventral corner of the third pleonal epimeron. The first and second pleonal epimera were not described for *P. longicaudatus.*

## Pardisynopia synopiae J. L. Barnard

*Pardisynopia synopiae* J. L. Barnard 1962b: 77-79, figs. 3, 4.

*Canyon material:* 6836(2), 6845(1), 6846(4).

*Slope material:* 2789(1).

## Tosilus, new genus

*Diagnosis:* Mouth parts not forming a conelike bundle; upper lip with bilaterally symmetrical lobes; lower lip apparently with inner lobes fused (not satisfactorily analyzed); mouthparts otherwise like those of *Pardaliscoides* (see Stebbing 1897: pl. 12), with long maxillipedal palp, short outer plates and obsolescent inner plates similar to those of *Necochea* J. L. Barnard (1962d), inner plate of maxilla 1 even more weakly developed, similar to that of *Necochea;* maxilla 2 with distinct lobes as drawn herein; mandible with palp; antenna 1 with accessory flagellum, articles 1-3 of peduncle successively shorter; fifth articles of gnathopods very short, not lobed, sixth articles about six times as long as fifth, slender, tapering, simple; pereopods simple; urosomal segments not dorsally produced; uropod 3 exceedingly small, not as long as the short ramus of uropod 2; telson short, cleft halfway.

*Type species: Tosilus arroyo*, new species.

*Relationship:* This genus resembles *Parpano* J. L. Barnard (1964a) in its miniaturized uropod 3, but the telson is cleft in *Tosilus* and entire in *Parpano*. The gnathopods also are similar. Apart from the small uropod 3, *Tosilus* differs from other pardaliscids as follows: from *Pardaliscoides* Stebbing in the short peduncular article 2 of antenna 1; from *Halice* Boeck in the short telson and short fifth articles of the gnathopods; from *Pardaliscella* Sars in the obsolescent inner plates of

the maxillipeds and first maxillae and the short fifth article of the gnathopods; from *Pardaliscopsis* Chevreux in the symmetrical upper lip and gnathopods; from *Necochea* J. L. Barnard in the well-developed second maxillae and normal coxae; from *Parahalice* Birstein & Vinogradov (1962) in the simple pereopods; from *Arculfia* J. L. Barnard (1961b) and *Princaxelia* Dahl (1959) in the gnathopods and lack of urosomal teeth.

### Tosilus arroyo, new species

(Fig. 35)

*Diagnosis:* With the characters of the genus.

*Description:* Third pleonal epimeron with medium-sized, upturned tooth; coxae poorly preserved and not accurately represented in the figures herein; head poorly preserved and only partially reconstructed in the figure.

*Holotype:* AHF No. 6010, female, 3.8 mm. Unique.

*Type locality:* Station 7049, La Jolla Canyon, 32°-49′-37″ N, 117°-35′-12″W, 976 m, May 7, 1960.

## Family PHOTIDAE (ISAEIDAE = senior synonym)

### Amphideutopus oculatus J. L. Barnard

*Amphideutopus oculatus* J. L. Barnard 1959c: 34-35, pl. 10; J. L. Barnard 1961a: 181, fig. 2.

*Canyon material:* 5367(3), 7031(4).

### Eurystheus thompsoni (Walker)

*Eurystheus thompsoni* (Walker).—Shoemaker 1955b: 59 (with references); J. L. Barnard 1959c: 36, pl. 11; J. L. Barnard 1961a: 182.

*Canyon material:* 4852(5), 6805(1).

### Megamphopus sp.

*Canyon material:* 6803(2), 6804(2).

### Photis bifurcata J. L. Barnard

*Photis bifurcata* J. L. Barnard 1962a: 30-31, fig. 10.

*Canyon material:* 4852(9).

### Photis brevipes Shoemaker

*Photis brevipes* Shoemaker 1942: 25-27, fig. 9; J. L. Barnard 1962a: 31-33, fig. 11.

*Canyon material:* 4851(5), 4852(46), 5367(3), 6803(7), 6821(3), 6822(?1), 6845(3), 6846(2).

### Photis lacia J. L. Barnard

*Photis lacia* J. L. Barnard 1962a: 42-44, fig. 18.

*Canyon material:* 6499(31).

### Photis macrotica J. L. Barnard

*Photis macrotica* J. L. Barnard 1962a: 44, fig. 19.

*Canyon material:* 6805(9), 6806(13), 7043(4).

### Photis spp.

*Canyon material:* Unidentifiable juveniles and females: 4851(1), 4852(3), 5960(2), 6499(4), 6803(146), 6804(91), 6806(12), 6817 (9), 6835(1), 6836(2), 6900(1), 7038(2).

### Protomedeia articulata J. L. Barnard

*Protomedeia articulata* J. L. Barnard 1962a: 48-50, fig. 21.

*Canyon material:* 5114(1), 6490 (20, blind), 6494 (111, blind), 6845(2), 7044(2).

### Protomedeia (?)prudens new species

(Fig. 36)

Lacking antennae, this species cannot be assigned definitely to a genus, for it might fit *Podoceropsis*, *Kermystheus*, *Megamphopus*, *Bonnierella*, *Goesia*, *Eurystheus* or *Protomedeia.*

*Diagnosis:* Coxa 1 angular in front but not acutely produced; coxa 2 scarcely larger than coxa 1 and bearing a medially projecting, hook-like accessory tooth; both pairs of gnathopods with greatly elongated fifth articles, article 6 of gnathopod 1 slender, bearing a projection in place of palm, posterior edge of article 6 setose and bearing stout spine just proximal to distal tooth; article 6 of gnathopod 2 much stouter than in gnathopod 1, palm transverse or essentially chelate, bearing two teeth, a short subacute middle tooth and a cheliform palm defining-tooth, posterior edge of article 6 with 2 large notches, dactyl long, overlapping palm considerably; inner ramus of uropod 3 about three-fourths as long as outer ramus; mouthparts like those of *Protomedeia fasciata* Krøyer as figured by Sars (1895: pl. 196).

*Holotype:* AHF No. 6017, male, 7.4 mm. Unique.

*Type locality:* Station 7038, La Jolla Canyon, 32°-52′-48″N, 117°-16′-32″W, 121 m, May 6, 1960.

*Relationship:* This species is unusual in *Protomedeia* for the elongation of article 5 of gnathopod 1, its produced palmar tooth, and the posterior notches on gnathopod 2; the medial coxal tooth of gnathopod 2 also is unique. No species of *Megamphopus* Norman has the kind of gnathopod 2 seen in this species.

## Family PHOXOCEPHALIDAE

### Coxophoxus, new genus

*Diagnosis:* Article 2 of pereopod 3 slender, scarcely wider than article 3; palp of maxilla 1 uniarticulate; flagellum of antenna 2 multiarticulate; gnathopods enlarged, first smaller than second; body of mandible lacking large process at juncture of palp, molar large, with ridged triturating surface; palp article 4 of maxilliped bearing large apical spine or spines, palp article 3 not produced; eyes present; antenna 2 lacking basal ensiform process; anteroventral corner of head unproduced; dorsoposterior edge of coxa 4 not excavate.

*Type species: Coxophoxus hidalgo*, new species.

*Relationship:* This genus combines characters of the genera *Phoxocephalus* Stebbing and *Proharpinia* Schellenberg. It differs from *Phoxocephalus* in the slender second article of pereopod 3 and from *Proharpinia* in the uniarticulate palp of the first maxilla and the unproduced cephalic corner.

*Other species assigned: Phoxocephalus coxalis* K. H. Barnard (1932).

### Coxophoxus hidalgo, new species

(Figs. 37, 38)

*Diagnosis:* Article 2 of pereopod 5 hugely expanded, more than 90 percent as wide as long.

*Description:* The figures presented herein show the other features. The male has the enlarged eyes typical of many phoxocephalids and an elongated inner ramus of the third uropod. The distolateral surface of article 1 on antenna 1 has a process.

*Holotype:* AHF No. 5810, male, 4.0 mm.

*Type locality:* Station 5943, East Cortes Basin, California, 32°-16′-30″N, 118°-27′-55″ W, 1675 m, November 10, 1958.

*Basin material:* 6 specimens from the type locality.

*Relationship:* This species differs from *Phoxocephalus coxalis* K. H. Barnard (1932), which I assign to this genus, by the much more broadly expanded second article of pereopod 5. In *C. coxalis* the article is only about 70 percent as broad as long.

### Harpiniopsis emeryi J. L. Barnard

*Harpiniopsis emeryi* J. L. Barnard 1960b: 334, pl. 69.

*Canyon material:* 2847(2), 6837(1), 6849(1), 7728(1).

*Basin material:* 2440(2), 2846(1), 2850(2), 3028(1), 5945(1), 6340(1).

*Slope material:* 2632(1), 2852(1), 3031(1).

### Harpiniopsis epistomata J. L. Barnard

*Harpiniopsis epistomatus* J. L. Barnard 1960b: 326-328, pls. 62, 63.

*Canyon material:* 2219(6), 2475(1), 2793(1), 2847(1), 6779(15), 6809(5), 6820(1), 6830(1), 6851(2), 6916(15), 7032(2), 7039(1), 7047(4), 7049(1), 7154(2), 7286(1), 7288(14), 7289(2), 7290(1), 7395(2), 7396(5), 7399(1), 7402(1), 7728(2).

*Basin material:* 2229(22), 2410(1), 2440(2), 2636(4), 3029(1), 3031(2), 5925(4), 5930(1).

*Slope material:* 2369(3), 2370(1), 2411(1), 2441(1), 2625(1), 2838(1), 2843(1), 2845(1), 2852(3), 3031(2).

### Harpiniopsis excavata (Chevreux)

*Harpinia excavata* Chevreux.—Chevreux 1900: 37-38, pl. 6, fig. 1; Stebbing 1906: 142-143; K. H. Barnard 1925: 340-341; Chevreux 1927: 73; J. L. Barnard 1960b: 353; J. L. Barnard 1962d: 47-50, figs. 37, 38; J. L. Barnard 1964a: 18-21, fig. 16.

*Harpiniopsis sanpedroensis* J. L. Barnard 1960b: 328-330, pls. 64, 65.

*Canyon material:* 6833(1).

*Basin material:* 2850(2).

### Harpiniopsis fulgens J. L. Barnard

*Harpiniopsis fulgens* J. L. Barnard 1960b: 332, pls. 67, 68.

*Canyon material:* 4851(1), 6815(2), 6822(1), 6831(1), 6837(1), 6845(6), 6898(10), 6900(1), 6903(1), 6909(1), 6915(4), 7032(1), 7047(4), 7054(8), 7174(4), 7288(1), 7396(1).

*Basin material:* 4669(1), 5930(2), 5933(1), 6338(1), 6348(1), 6351(4), 6832(2).

*Slope material:* 2224(2), 2293(2), 2306(8), 2337(1), 2361(4), 2423(3), 2625(8), 2632(5), 2749(1), 2789(2), 2790(2), 2851(4), 3204(3).

### Harpiniopsis galera J. L. Barnard

*Harpiniopsis galerus* J. L. Barnard 1960b: 336, pls. 70-72.

*Slope material:* 2227(2), 2230(?1), 2367(2), 2413(1), 2414(2), 2851(1).

### Harpiniopsis naiadis J. L. Barnard

*Harpiniopsis naiadis* J. L. Barnard 1960b: 336-339, pl. 73.

*Canyon material:* 6820(4), 6850(1), 7049(1).

*Slope material:* 2302(2).

**Harpiniopsis petulans, new species**

(Fig. 39)

*Diagnosis:* Anteroventral corner of head unproduced; epistome acutely produced anteriorly; article 2 of pereopod 5 broad, produced downward truncately to end of article 4, with 2 small posterior teeth below 4 minute serrations; third pleonal epimeron with a very long posterior tooth curving dorsally; rami of uropod 2 naked.

*Holotype:* AHF No. 6011, female, 4.5 mm. Unique.

*Type locality:* Station 6842, Coronado Canyon, California, 32°-22′-50″ N, 117°-22′-12″ W, 1265 m, January 31, 1960.

*Relationship:* This species differs from *Harpiniopsis epistomata* J. L. Barnard (1960b) in the immense tooth of the third pleonal epimeron. In that character it closely resembles *H. emeryi* J. L. Barnard (1960b) but differs in the acutely produced epistome, the much larger and broader second article of pereopod 5, and the relatively short remainder of the appendage.

**Harpiniopsis profundis J. L. Barnard**

*Harpiniopsis profundis* J. L. Barnard 1960b: 330, pl. 66.

*Canyon material:* 6844(1), 7049(2).

*Basin material:* 2850(1).

*Slope material:* 2344(?1).

**Harpiniopsis profundis J. L. Barnard var.**

(Fig. 40)

*Diagnosis:* Differing from normal adults in (1) the somewhat broader posterior lobe on article 2 of pereopod 5, the more strongly truncated oblique ventral margin bearing shallower teeth; (2) the lack of spines on the rami of uropod 1.

*Catalogued material:* AHF No. 606, male, 4.8 mm.

*Locality:* Station 6832, Tanner Canyon, 32°-33′-36″N, 118°-55′-40″W, 1298 m, January 29, 1960.

*Material:* Two specimens from the catalogued locality.

*Remarks:* Materials under examination from deep waters off Baja California show this juvenile form to be connected to the terminal adult as figured by Barnard (1960b), through enlargement and disproportionment of the teeth of pereopod 5 and the development of spines on the inner ramus of uropod 2.

**Harpiniopsis spp.**

*Basin material:* 5937(1), 5940(1), 6092(1), 6346(1), 6347(1).

### Heterophoxus oculatus (Holmes)

*Heterophoxus oculatus* (Holmes).—J. L. Barnard 1960b: 320-324, pls. 59-61 (with references); J. L. Barnard 1961b: 71.

*Slope material:* 2151(1), 2224(1), 2227(2), 2228(1), 2229(1), 2231(11), 2302(1), 2306(1), 2324(3), 2337(5), 2344(1), 2361(10), 2369(3), 2370(2), 2389(5), 2413(6), 2414(2), 2423(5), 2625(1), 2632(1), 2724(7), 2789(21), 2843(1), 2845(1), 2849(1), 2850(2), 2851(1), 3031(3), 3204(9), 7135(1).

*Basin material:* Stations 2130(1), 2636(1), 2849(1), 2850(2), 3027(3), 3028(1), 5925(1), 5926(1), 5930(2), 5933(?1), 5935(1), 6089(1), 6336(1), 6338(2), 6339(1), 6341(1), 6342(2), 6344(1), 6347(1), 6810(2), 6832(1).

*Canyon material:* Stations 2149(1), 2189(11), 2191(5), 2725(1), 2727(12), 3000(5), 3179(1), 3180(1), 3385(11), 4851(2), 5046(2), 5115(2) 5367(1), 5531(4), 5532(2), 5960(21), 6498(2), 6499(1), 6805(1), 6806(5), 6815(10), 6818(4), 6819(5), 6821(6), 6822(9), 6836(2), 6837(2), 6845(6), 6846(4), 6851(1), 6854(1), 6897(2), 6898(8), 6899(5), 6903(3), 6909(2), 6915(1), 7029(21), 7038(25), 7039(1), 7045(1), 7047(2), 7051(2), 7054(2), 7174(20), 7285(1), 7728(2), 7730(2).

*Remarks:* This species is strongly eurybathic, ranging in depth from 2 to 3 meters on shallow sands, especially in arid lagoons where winter temperatures are low, to nearly abyssal depths in the basins off southern California; and is distributed from Puget Sound, Washington, to Panama.

In slope depths greater than 200 m almost all of the specimens lack eyes. This is the most abundant canyon species but is not an indicator of bathyl depths because of its eurybathicity.

### Leptophoxus falcatus icelus J. L. Barnard

*Leptophoxus falcatus icelus* J. L. Barnard 1960b: 308-311, pls. 53, 54.

*Basin material:* 2846(1), 5938(1), 6828(2).

*Slope material:* 2303(1), 2389(1), 2413(3), 2423(2), 2845(1), 2851(2).

*Canyon material:* 2793(2).

*Remarks:* The 2.5 mm male of 5938 has 4 posterior serrations on article 2 of pereopod 5 and is thus intermediate between the stem subspecies and *L. falcatus icelus*.

### Metaphoxus frequens J. L. Barnard

*Metaphoxus frequens* J. L. Barnard 1960b: 304-306, pls. 51, 52.

*Canyon material:* 2192(2), 2725(7), 2727(19), 3385(37), 5367(1), 5960(44), 6781(2), 6806(4), 6835(1), 6836(5), 6845(9), 6846(10), 6854(1), 7038(1).

*Slope material:* 2231(6), 2789(12), 3204(9).

### Paraphoxus abronius J. L. Barnard

*Paraphoxus abronius* J. L. Barnard 1960b: 203-205, pl. 5.

*Canyon material:* 7045(1).

### Paraphoxus bicuspidatus J. L. Barnard

*Paraphoxus bicuspidatus* J. L. Barnard 1960b: 218-221, pls. 15, 16; J. L. Barnard 1963: 462-463.

*Canyon material:* 2725(8), 2727(13), 3385(40), 5367(8), 5531(1), 5532(1), 5960(11), 6845(21), 6846(12), 6854(1), 6897(2), 6904(1), 7044(3), 7045(2).

*Slope material:* 2231(10), 2789(6), 3204(22).

### Paraphoxus calcaratus (Gurjanova)

*Parpharpinia calcarata* Gurjanova 1938: 271-272, figs. 9a-b; *Pararpinia calcarata.*—Gurjanova 1951: 388-392, fig. 237.

*Paraphoxus calcaratus.*—J. L. Barnard 1960b: 238-240, pl. 26.

*Canyon material:* 6804(85), 6806(5), 6836(13).

*Slope material:* 2367(1), 2414(4).

### Paraphoxus daboius J. L. Barnard

*Paraphoxus daboius* J. L. Barnard 1960b: 210-212, pls. 10, 11.

*Canyon material:* 6803(1), 6833(9), 6836(1), 7728(1).

*Slope material:* 2227(14), 2228(1), 2344(2), 2367(8), 2423(5).

### Paraphoxus epistomus (Shoemaker)

*Pontharpinia epistoma* Shoemaker 1938: 326-329, fig. 1.

*Paraphoxus epistomus.*—J. L. Barnard 1960b: 205-209, pls. 6-8.

*Canyon material:* 4852(65), 5114(1), 5367(1), 5674(1).

### Paraphoxus fatigans J. L. Barnard

*Paraphoxus fatigans* J. L. Barnard 1960b: 209-210, pl. 9.

*Canyon material:* 4852(20).

*Slope material:* 2344(1).

### Paraphoxus heterocuspidatus J. L. Barnard

*Paraphoxus heterocuspidatus* J. L. Barnard 1960b: 224-226, pls. 19, 20.

*Canyon material:* 4852(4).

### Paraphoxus obtusidens (Alderman)

*Paraphoxus obtusidens* (Alderman).—J. L. Barnard 1960b: 249-259, pls. 33-37 (with references).

*Canyon material:* 3164(1), 4852(34), 6803(14), 6804(48), 6835 (4).

*Slope material:* 3204(2).

### Paraphoxus oculatus Sars

*Paraphoxus oculatus* Sars.—J. L. Barnard 1960b: 240-243, pls. 27, 28 (with references).

*Canyon material:* 2148(3), 2149(1), 3166(1), 3179(1), 3180(2), 4851(4), 6494(1), 6815(2), 6837(?1), 6851(1).

*Basin material:* 2850(2).

*Slope material:* 2293(7), 2369(1), 2413(2), 2625(1), 2632(3), 2749(6).

### Paraphoxus robustus Holmes

*Paraphoxus robustus* Holmes 1908: 518-521, fig. 27; J. L. Barnard 1960b: 235-236, pl. 25.

*Canyon material:* 2727(2), 5960(1), 6501(?1), 6806(3), 6846(6).

*Slope material:* 3204(1).

### Paraphoxus similis J. L. Barnard

*Paraphoxus similis* J. L. Barnard 1960b: 230-233, pls. 22, 23.

*Canyon material:* 2192(1), 2725(5), 2727(1), 3385(13), 5114(1), 5367(8), 5960(3), 6817(4), 6846(6).

*Slope material:* 2414(3), 3204(17).

### Paraphoxus spinosus Holmes

*Paraphoxus spinosus* Holmes 1905: 477-478, fig.; Kunkel 1918: 76-78, fig. 13; Shoemaker 1925: 26-27; J. L. Barnard 1959c: 18; J. L. Barnard 1960b: 243-249, pls. 29-31; J. L. Barnard 1961a: 178.

*Canyon material:* 3167(1), 4852(19), 6805(1), 6806(1), 6817 (46).

### Paraphoxus stenodes J. L. Barnard

*Paraphoxus stenodes* J. L. Barnard 1960b: 221-224, pls. 17, 18.

*Canyon material:* 3166(1), 4852(55), 5505(2), 6835(2), 7031(1).

### Paraphoxus tridentatus (J. L. Barnard)

*Pontharpinia tridentata* J. L. Barnard 1954a: 4-6, pls. 4, 5.
*Paraphoxus tridentatus.*—J. L. Barnard 1960b: 261-262.

*Canyon material:* 6803(4).

### Paraphoxus variatus J. L. Barnard

*Paraphoxus variatus* J. L. Barnard 1960b: 198-202, pls. 3, 4.

*Canyon material:* 4852(2).

### Phoxocephalus homilis J. L. Barnard

*Phoxocephalus homilis* J. L. Barnard 1960b: 301-303, pls. 49, 50.

*Canyon material:* 2149(1), 2191(6), 2192(3), 2725(3), 2727(2), 2999(1), 3385(19), 4851(2), 5046(1) 5115(1), 5960(13), 6497(4), 6779(1), 6806(2), 6815(10), 6845(9), 6846(1), 6854(4), 6898(16), 6899(2), 6900(1), 6911(1), 7032(8), 7038(8), 7174(9), 7285(2).

*Basin material:* 4669(1).

*Slope material:* 2293(8), 2361(1), 2418(1), 2625(1), 2632(7), 2749(10), 2789(12), 2851(8), 2852(6), 3204(1).

## Family PLEUSTIDAE

### Parapleustes pugettensis (Dana)

*Parapleustes pugettensis* (Dana).—Barnard and Given 1960: 43-45, fig. 4 (with references).

*Canyon material:* 4852(89).

### Sympleustes subglaber Barnard & Given

*Sympleustes subglaber* Barnard and Given 1960: 45-46, fig. 5.

*Canyon material:* 6781(2).

## Family PODOCERIDAE

### Dulichia sp.

*Canyon material:* 6499(1 female).

### Podocerus cristatus (Thomson)

*Podocerus cristatus* (Thomson).—J. L. Barnard 1962a: 67-69, figs. 31, 32.

*Canyon material:* 4851(2).

## Family STENOTHOIDAE

### Mesometopa neglecta roya, new subspecies

(Fig. 41)

References to typical subspecies:

[*Metopa neglecta* Hansen.—Sars 1895: 274-275, pl. 97, fig. 2.
*Metopella neglecta* (Hansen).—Gurjanova 1951: 473-474, fig. 310.
*Mesometopa neglecta* (Hansen).—Shoemaker 1955a: 24, figs. 8a-f.]

*Description:* Lateral cephalic lobe sharp as in *Mesometopa neglecta* Hansen (Sars. 1895: pl. 97, fig. 2), eye small, composed of 8 to 10 large ommatidia loosely arranged; antennae reaching to end of fifth pereonite; mandibular palp 2-articulate, appearing to be absent on one mandible and present on other; palp of maxilla 1 uniarticulate; gnathopod 1 simple, article 7 not setose; gnathopod 2 small, article 6 trapezoidal, expanded distally, palm oblique, sharply defined by a small cusp, bearing two large defining spines; article 2 of pereopods 3-4 very slender; article 2 of pereopod 5 broad proximally, suddenly constricted on distal half; articles 4 and 5 of pereopods 3-5 very slender, not produced distally; third pleonal epimeron projecting strongly posteriorly; telson with 2 marginal spines on each side.

*Holotype:* AHF No. 5920, female, 3.0 mm.

*Type locality:* Station 6806, Santa Cruz Canyon, California, 33°-56′-06″ N, 118°-52′-17″ W, 221 m, December 22, 1959.

*Material:* Four specimens from the type locality.

*Remarks: Mesometopa gibbosa* Shoemaker (1955a) should be removed to the genus *Metopella* Sars because the second article of pereopod 5 is slender. The remaining 3 species, *Mesometopa esmarki* (Boeck), *M. extensa* Gurjanova and *M. neglecta* (Hansen), differ among themselves more than the present material differs from *M. neglecta,* so these specimens are relegated to subspecific status. The larger, fewer, and more loosely compacted ommatidia of the new subspecies differ from the more numerous, smaller, more compacted ommatidia of the stem species and the proximal and distal portions of article 2 on pereopod 5 are more sharply differentiated. The palm of gnathopod 2 has a small medial cusp, not reported for *M. neglecta neglecta.* Probably the eye differences are a reflection of the greater depth recorded for the new subspecies.

### Metopa (Prometopa) samsiluna, new species

(Fig. 42)

*Diagnosis:* Assigned to the subgenus *Prometopa* Schellenberg by possession of a vestigial accessory flagellum; mandibular palp 3-articu-

late, first maxillary palp uniarticulate; eyes absent; antennae very long, subequal, peduncular articles of both antennae elongated, article 2 of antenna 1 longer than article 1; coxa 2 very broad; gnathopod 1 short, with distinct palm, article 6 expanded, article 7 short, fitting palm, not setose, article 4 strongly projecting posteriorly along article 5, article 2 strongly setose anteriorly; palm of gnathopod 2 with a large medial tooth, defining corner with large tooth; lobe on article 2 of pereopods 4 and 5 narrowing posterodistally, article 4 narrow, scarcely decurrent; telson spinose.

*Holotype:* AHF No. 6013, female, 4.5 mm. Unique.

*Type locality:* Station 6840, San Clemente Rift Valley, California, 32°-44′-35″ N, 118°-12′-45″ W, 1620 m, January 30, 1960.

*Relationship:* This species differs from *M. boeckii* Sars (1895: pl. 88) in the presence of the medial palmar tooth on the second gnathopodal palm, the narrower distoposterior lobes on article 2 of pereopods 4-5, the broader second coxa and the shorter first gnathopod with a more projecting fourth article and more distinct palm.

From *M. spectabilis* Sars (1895: pl. 87) this species differs in the equal antennae.

*Metopa alderi* (Spence Bate) (Sars 1895: pl. 86) is closely related and *M. samsiluna* may be a form of *M. alderi* but it differs in the lack of eyes, the spinose telson, the longer antennae, the better developed medial palmar tooth of gnathopod 2 and the narrower distoposterior lobes on article 2 of pereopods 4-5.

The new species resembles *M. aequicornis* Sars (1885), especially in the long, equal antennae and large coxa 2, but differs in the narrow, scarcely decurrent fourth articles of pereopods 4 and 5 and the spinose telson.

*Metopa layi* Gurjanova (see 1951) has short articles 1 and 2 of antenna 1.

## Metopa sp.

(Fig. 43)

*Material:* One female, 2.2 mm, from Station 6499, Monterey Canyon.

*Relationship:* This specimen has affinities with *Metopa pusilla* Sars (1895: pl. 90, fig. 1) and may be identified with it although minor differences are noted as follows: the first gnathopod is slightly stouter and article 4 does not project posteriorly as much; coxa 4 is more elongated antero-posteriorly.

From *M. longicornis* Sars (1895: pl. 90, fig. 2) this species differs in the strongly projecting posterodistal corner of article 4 on pereopod 5. The female gnathopod 2 of *M. tenuimana* Sars (1895: pl. 91, fig. 1) is more slender and the palm more oblique than in the present material, but the figures of that species in Stephensen (1931) are close to the material at hand. Article 2 of pereopod 4 is stouter in *M. bruzelii* Goës (Sars 1895: pl. 92, fig. 1) then in the present specimen. The posterior lobe of article 5 on female gnathopod 2 is much stouter and longer in *M. invalida* Sars (1895: pl. 94, fig. 2). Article 4 of pereopod 5 is much stouter in *M. aequicornis* Sars (1885: pl. 15, fig. 5). Article 6 of gnathopod 1 is less tumid medially than in *M. boeckii* Sars (1895: pl. 88).

The specimen also bears comparison to *M. layi* Gurjanova (see 1951) but article 6 of gnathopod 1 in that species is slightly stouter.

### Metopella (?) aporpis J. L. Barnard

*Metopella aporpis* J. L. Barnard 1962c: 142-145, figs. 12, 13.

*Canyon material:* 6805 (3).

*Remarks:* Further study of the mandible of this species reveals no small basal article on the palp, hence the single long article (similar to *Mesostenothoides pirloti* Gurjanova 1951: 466, fig. 305A) indicates that this species should be assigned to *Metopelloides;* but its first gnathopod bears no similarity to other species of that genus which have article 5 much shorter than 6 (except two species having very short gnathopod 1, in one case with a palm). Since the present species is distinct from any known species of *Metopelloides*, I prefer to retain it temporarily in *Metopella* until a more thorough study is made of the classificatory value of mandibles and maxillae in this family.

### Proboloides tunda J. L. Barnard

(Fig. 44)

*Proboloides tunda* J. L. Barnard 1962c: 147-149, fig. 16.

*Canyon material:* 7041 (2), 7290 (3).

*Remarks:* The second gnathopod illustrated here is more fully developed than that shown by Barnard (1962b).

### Stenothoides bicoma J. L. Barnard

*Stenothoides* (?) *bicoma* J. L. Barnard 1962c: 135-137, fig. 8.

*Canyon material:* 4852 (1), 6805 (1).

## Family SYNOPIIDAE (=Tironidae)

### Bruzelia ascua, new species

(Figs. 45, 46)

*Diagnosis:* Rostrum long, straight, nearly in line with cephalic axis, dorsum of head with two sharp bilateral keels, eyes not visible; pereonite 1 lacking dorsal tooth, all following pereonal, metasomal and the first two urosomal segments with a long, acute, dorsal projection each; each pereonal and metasomal segment with a subdorsal tooth and a lateral tooth, the lateral teeth of pereonites occurring at ventral margins just above coxae; coxae 5 and 6 each with a laterally projecting tooth; coxa 4 much shorter than 3, with a posterior cusp and dorsoposterior excavation; second and third pleonal epimera each with a slender, long, unserrated posteroventral tooth; second articles of pereopods 3-5 each with 2 or 3 medium-sized posterior cusps, posteroventral corners strongly produced.

*Holotype:* AHF No. 5812, male, 4.7 mm. Unique.

*Type locality:* Station 5938, Patton Escarpment, 32°-04′-30″ N, 119°-43′-20″ W, 1687 m, November 9, 1958.

*Relationship:* This species differs from *Bruzelia dentata* Stephensen (1931a) in the extra set of teeth located subdorsally and laterally on the pereonal and metasomal segments, the unserrated peonal epimera and the presence of dorsal cephalic keels.

*Bruzelia ascua* differs from *B. australis* Stebbing (1910) in the presence of lateral and subdorsal pereonal teeth and the presence of dorsal teeth on pleonites 3-5.

Other species of *Bruzelia* have fewer dorsal teeth or much smaller dorsal carinae than those mentioned above.

### Bruzelia tuberculata G. O. Sars

*Bruzelia tuberculata* G. O. Sars 1895: 397-398, pl. 139, fig. 2; Stebbing 1906: 275; Stephensen 1931a: 252; Stephensen 1938: 232; Gurjanova 1951: 589, fig. 395; J. L. Barnard 1962b: 73.

*Canyon material:* 7038 (one female, 5 mm).

*Other material:* 5761 (1), 5828 (1).

### Garosyrrhoe bigarra (J. L. Barnard)

*Syrrhoites bigarra* J. L. Barnard 1962b: 73-75, fig. 1.

*Canyon material:* 6803 (1).

**Syrrhoe** sp.

Not to be described until more materials can be obtained.

*Material:* 6845(1).

Unidentifiable specimens

*Material:* 2169(2), 2849(1), 2850(1 stenothoid), 2850(3), 4669 (1), 4851(5, *Liljeborgia* sp.?), 4852(11, *Protomedeia*?), 5046(1), 5114(1 pontogeneiid), 5938(1, ?*Haploops*), 5938(1, *Harpinioides* sp.), 5938(1, ?*Pardaliscella*), 6336(1, ?*Orchomene*), 6351(1), 6372 (1), 6803 (1, Lysianassidae), 6805(1, Stenothoidae), 6810(1), 7043 (1), 7054(1 oedicerotid).

## LITERATURE CITED

ALDERMAN, A. L.

1936. Some new and little known amphipods of California. Univ. Calif. Publ. Zool., 41(7):53-74, 51 figs.

BARNARD, J. L.

1954a. Marine Amphipoda of Oregon. Oregon State Monographs, Studies in Zoology, 8:1-103, 1 fig., 33 pls.

1954b. Amphipoda of the family Ampeliscidae collected in the Eastern Pacific Ocean by the Velero *III* and Velero *IV*. Allan Hancock Pacific Expeds., 18(1): 1-137, 38 pls.

1955a. Gammaridean Amphipoda (Crustacea) in the collections of Bishop Museum. Bernice P. Bishop Museum, Bull., 215:1-46, 20 pls.

1955b. Notes on the amphipod genus *Aruga* with the description of a new species. So. Calif. Acad. Sci., Bull., 54: 97-103, pls. 27-29.

1957. A new genus of haustoriid amphipod from the northeastern Pacific Ocean and the southern distribution of *Urothoe varvarini* Gurjanova. So. Calif. Acad. Sci., Bull., 56:81-84, pl. 16.

1958a. A new genus of dexaminid amphipod (marine Crustacea) from California. So. Calif. Acad. Sci., Bull., 56:130-132, pls. 26-27.

1958b. Revisionary notes on the Phoxocephalidae (Amphipoda), with a key to the genera. Pacific Science, 12:146-151.

1959a. Liljeborgiid amphipods of southern California coastal bottoms, with a revision of the family. Pacific Naturalist, 1(4):12-28, 12 figs., 3 charts.

1959b. The common pardaliscid Amphipoda of southern California, with a revision of the family. Pacific Naturalist, 1(12):36-43, 4 figs.

1959c. Estuarine Amphipoda. *In* Barnard, J. L., and D. J. Reish, Ecology of Amphipoda, Polychaeta of Newport Bay, California. Allan Hancock Foundation, Occas. Pa., 21:13-69, 14 pls.

1960a. New bathyal and sublittoral ampeliscid amphipods from California, with an illustrated key to Ampelisca. Pacific Naturalist, 1(16):1-36, 11 figs.

1960b. The amphipod family Phoxocephalidae in the eastern Pacific Ocean, with analyses of other species and notes for a revision of the family. Allan Hancock Pacific Expeds., 18(3):175-368, 75 pls., 1 chart.

1961a. Relationship of Californian amphipod faunas in Newport Bay and in the open sea. Pacific Naturalist, 2(4):166-186, 2 figs.

1961b. Gammaridean Amphipoda from depths of 400 to 6000 meters. *In* Danish Deep-Sea Exped. round the world 1950-52. Galathea Rpt., Copenhagen, 5:23-128, 83 figs.

1962a. Benthic marine Amphipoda of southern California: Families Aoridae, Photidae, Ischyroceridae, Corophiidae, Podoceridae. Pacific Naturalist, 3:1-72, 32 figs.

1962b. Benthic marine Amphipoda of southern California: Families Tironidae to Gammaridae. Pacific Naturalist, 3:73-115, 23 figs.

1962c. Benthic marine Amphipoda of southern California: Families Amphilochidae, Leucothoidae, Stenothoidae, Argissidae, Hyalidae. Pacific Naturalist, 3:116-163, 23 figs.

1962d. South Atlantic abyssal amphipods collected by R. V. *Vema*. *In* Barnard, J. L., R. J. Menzies, M. C. Bacescu, Abyssal Crustacea, Columbia Univ. Press (Vema Res. Ser., No. 1):1-78, 79 figs.

1962e. Benthic marine Amphipoda of southern California: Family Oedicerotidae. Pacific Naturalist, 3:349-371, 10 figs.

1963. Relationship of benthic Amphipoda to invertebrate communities of inshore sublittoral sands of southern California. Pacific Naturalist, 3:437-467, 7 figs.

1964a. Deep-sea Amphipoda (Crustacea) collected by the R/V "Vema" in the eastern Pacific Ocean and the Caribbean and Mediterranean seas. Amer. Mus. Nat. Hist., Bull., 127(1):1-46, 33 figs.

1964b. Los anfipodos bentonicos marinos de la Costa occidental de Baja California. Soc. Mexicana Hist. Nat., Rev., 24:205-273, 11 figs.

1964c. Marine Amphipoda of Bahia de San Quintin, Baja California. Pacific Naturalist, 4:53-139, 21 figs., 17 charts.

BARNARD, J. L., and R. R. GIVEN

1960. Common pleustid amphipods of southern California, with a projected revision of the family. Pacific Naturalist, 1(17):37-48, 6 figs.

BARNARD, J. L., and O. HARTMAN

1959. The sea bottom off Santa Barbara, California: Biomass and community structure. Pacific Naturalist, 1(6):1-16, 7 figs.

BARNARD, J. L., and F. C. ZIESENHENNE

1961. Ophiuroid communities of southern Californian coastal bottoms. Pacific Naturalist, 2(2):131-152, 8 figs.

BARNARD, K. H.

1916. Contributions to the crustacean fauna of South Africa. 5.—The Amphipoda. So. African Mus., Ann., 15(3):105-302, pls. 26-28.

1925. Contributions to the crustacean fauna of South Africa.—No. 8. Further additions to the list of Amphipoda. So. African Mus., Ann., 20(5):319-380, pl. 34.

1930. Amphipoda. *In* British Antarctic ("Terra Nova") Exped., 1910. Nat. Hist. Rpt., Zool., London, 8:307-454, 63 figs.

1932. Amphipoda. *In* Discovery Rpts., Cambridge, Eng., 5:1-326, 174 figs., pl. 1.

BIRSTEIN, J. A., and M. E. VINOGRADOV

1955. Pelagicheskie gammaridy (Amphipoda-Gammaridae) Kurilo-Kamchatskoĭ Vpadiny. Akad. Nauk SSSR, Inst. Okean., Trudy, 12:210-287, 35 figs.

1962. Notes on the family Pardaliscidae (Amphipoda) with the description of a new genus. Crustaceana, 3:249-258, 2 figs.

BRUUN, A. F.

1957. Deep sea and abyssal depths. *In* Natl. Res. Council, Treatise on Marine Ecology and Paleoecology, I, Ecology, ed. by J. W Hedgpeth, New York. Geol. Soc. Amer., Mem., 67:641-672.

1959. General introduction to the reports and list of deep-sea stations. *In* Danish Deep-Sea Exped. round the world 1950-52. Galathea Rpt., Copenhagen, 1:7-48, 11 figs., 4 pls.

BUFFINGTON, E. C.

1964. Structural control and precision bathymetry of La Jolla submarine canyon, California. Marine Geology, 1:44-58.

BULYCHEVA, A.

1936. New species of Amphipoda from the Japan Sea. Ann. Mag. Nat. Hist., (10)18:242-256, 35 figs.

1955. Novye vidy bokoplavov (Amphipoda, Gammaridea) iz IAponskogo Moria: II. Akad. Nauk SSSR., Zool. Inst., Trudy, 21:193-207, 6 figs.

CHEVREUX, E.

1900. Amphipodes provenant des campagnes de l'*Hirondelle* (1885-1888). *In* Albert I, prince of Monaco, Rés. Camp. Sci., Monaco, 16:i-iv, 1-195, 18 pls.

1908. Diagnoses d'Amphipodes nouveaux provenant des campagnes de la *Princesse-Alice* dans l'Atlantique Nord. Inst. Océanogr., Bull., 129:1-12, 6 figs.

1926. Diagnoses d'Amphipodes nouveaux provenant des campagnes de la "Princesse-Alice" dans l'Atlantique et dans l'Océan Arctique. Inst. Océanogr., Bull., 475:1-12, 6 figs.

1927. Crustacés Amphipodes. *In* Expéd. Sci. "Travailleur" et du "Talisman" pendant les années 1880, 1881, 1882, 1883. Malacostracés (Suite), Paris, 9:41-152, 14 pls.

CHEVREUX, E., and L. FAGE

1925. Amphipodes. Faune de France, Paris, 9:1-488, 438 figs.

DAHL, E.

1946. Notes on some Amphipoda from the Gullmar Fiord. Ark. Zool., 38A(8):1-8, 5 figs.

1959. Amphipoda from depths exceeding 6000 meters. *In* Danish Deep-Sea Exped. round the world 1950-52. Galathea Rpt., Copenhagen, 1:211-240, 20 figs.

DILL, R. F.

1962. Sedimentary and erosional features of submarine canyon heads. First Natl. Coastal and Shallow Water Res. Conf., Oct., 1961, Proc., Tallahassee [etc.], p. 531.

EMERY, K. O.

1960. The sea off southern California; a modern habitat of petroleum. New York, Wiley, 366p.

EMERY, K. O., and J. HÜLSEMANN

1963. Submarine canyons of southern California. Part I. Topography, water, and sediments. Allan Hancock Pacific Expeds., 27(1):1-80, 22 figs.

EMERY, K. O., J. HÜLSEMANN, and K. S. RODOLFO

1962. Influence of turbidity currents upon basin waters. Limnol. and Oceanog., 7:439-446, 5 figs.

EMERY, K. O., and R. D. TERRY

1956. A submarine slope of southern California. Jour. Geol., 64:271-280.

ENEQUIST, P.

1950. Studies on the soft-bottom amphipods of the Skagerak. Uppsala, Zool. Bidrag, 28:297-492, 67 figs., 6 charts.

GURJANOVA, E.

1938. Amphipoda, Gammaroidea of Siaukhu Bay and Sudzukhe Bay (Japan Sea). *In* Akad. Nauk SSSR, Dal'nevost. filial, Vladivostok. Rpts. of the Japan Sea Hydrobiol. Exped. in 1934, 1:241-404, 59 figs. (English summary, pp. 382-404.)

1951. Bokoplavy moreĭ SSSR i sopredel'nykh vod (Amphipoda-Gammaridea). Akad. Nauk SSSR. Opredel. Faune SSSR, 41:1-1029, 705 figs.

1952. Novye vidy bokoplavov (Amphipoda, Gammaridea) iz dal'nevostochnykh moreĭ. Akad. Nauk SSSR, Zool. Inst., Trudy, 12:171-194, 17 figs.

1953. Novye dopolneniia k dal'nevostochnoĭ faune morskikh bokoplavov. Akad. Nauk SSSR, Zool. Inst., Trudy, 13:216-241, 19 figs.

1955. Novye vidy bokoplavov (Amphipoda, Gammaridea) iz severnoĭ chasti Tikhogo Okeana. Akad. Nauk SSSR, Zool. Inst., Trudy, 18:166-218, 23 figs.

1962. Bokoplavy severnoĭ chasti Tikhogo Okeana (Amphipoda-Gammaridea) chast' I. Akad. Nauk SSSR, Opredel. Faune SSSR, 74:1-440, 143 figs.

HARTMAN, O.

1955. Quantitative survey of the benthos of San Pedro Basin, southern California. Part I, Preliminary results. Allan Hancock Pacific Expeds., 19:1-185.

1963. Submarine canyons of southern California. Part II, Biology. Allan Hancock Pacific Expeds., 27(2):1-424, 27 figs.

HARTMAN, O., and J. L. BARNARD

1958. The benthic fauna of the deep basins off southern California. Allan Hancock Pacific Expeds., 22(1):1-67, pls. 1-2, chart, 2 tables.

1960. The benthic fauna of the deep basins off southern California. Part II, Continued studies in the seaward and deeper basins. Allan Hancock Pacific Expeds., 22:217-284, 1 chart.

HEDGPETH, J. W.

1957. Classification of marine environments. *In* Natl. Res. Council, Treatise on Marine Ecology and Paleoecology, I, Ecology, ed. by J. W. Hedgpeth, New York. Geol. Soc. Amer., Mem., 67:17-28, 5 figs.

HEEZEN, B. C., M. EWING, and R. J. MENZIES

1955. The influence of submarine turbidity currents on abyssal productivity. Oikos, 6:170-182, 7 figs.

HOLMES, S. J.

1905. The Amphipoda of southern New England. U. S. Bur. Fish., Bull., 24:459-529, 13 pls, numerous figs.

1908. The Amphipoda collected by the U. S. Bureau of Fisheries Steamer "Albatross" off the west coast of North America, in 1903 and 1904, with descriptions of a new family and several new genera and species. U. S. Natl. Mus., Proc., 35:489-543, 46 figs.

HURLEY, D. E.

1963. Amphipoda of the family Lysianassidae from the west coast of North and Central America. Allan Hancock Found., Occas. Pa., 25:1-160, 49 figs.

JOHNSON, M. A.

1964. Turbidity currents. Oceanogr. Mar. Biol. Ann. Rev., 2:31-43.

KUNKEL, B. W.

1918. The Arthrostraca of Connecticut. Part I, Amphipoda. Conn. Geol. Nat. Hist. Survey, Bull., 6, no. 26:15-181, 55 figs.

MADSEN, F. J.

1961. On the zoogeography and origin of the abyssal fauna, in view of the knowledge of the Porcellanasteridae. *In* Danish Deep-Sea Exped. round the world 1950-52. Galathea Rpt., Copenhagen, 4:177-218.

MENZIES, R. J., AND J. IMBRIE

1958. The antiquity of the deep sea bottom fauna. Oikos, 9:192-210, 2 figs.

MILLS, E. L.

1961. Amphipod crustaceans of the Pacific coast of Canada. I. Family Atylidae. Canada, Natl. Mus., Bull., 172:13-33, 4 figs.

1962a. Amphipod crustaceans of the Pacific coast of Canada. II. Family Oedicerotidae. Canada, Natl. Mus., Nat. Hist. Pa., 15:1-21, 6 figs.

1962b. A new species of liljeborgiid amphipod, with notes on its biology. Crustaceana, 4:158-162, 2 figs.

NAGATA, K.

1960. Preliminary notes on benthic gammaridean Amphipoda from the *Zostera* region of Mihara Bay, Seto Inland Sea, Japan. Seto Mar. Biol. Lab., Publ., 8(1):163-182, 2 figs., pls. 13-17.

NICHOLLS, G. E.

1938. Amphipoda Gammaridea. *In* Australasian Antarctic Exped. 1911-14. Sci. Rpt., ser. C., Zool. and Bot., Sydney, 2(4):1-145, 67 figs.

NORMAN, A. M.

1900. British Amphipoda: Fam. *Lysianassidae* (concluded) Ann. Mag. Nat. Hist., (7) 5:196-214, pl. 6.

PILLAI, N. K.

1957. Pelagic Crustacea of Travancore. III. Amphipoda. Univ. Travancore, Central Res. Inst., Trivandrum, Ser. C., Nat. Sci., 5(1):29-68, 18 figs.

PIRLOT, J. M.

1936. Les amphipodes de l'Expédition du Siboga. Deuxième partie. Les amphipodes gammarides. II.—Les amphipodes de la mer profonde. 3. Addendum et partie générale. III.—Les amphipodes littoraux. 1. Lysianassidae, Ampeliscidae, Leucothoidae, Stenothoidae, Phliantidae, Colomastigidae, Ochlesidae, Liljeborgiidae, Oedicerotidae, Synopiidae, Eusiridae, Gammaridae. *In* Siboga-Exped., Mon., Leiden, 33e:237-328, figs. 101-146.

REISH, D. J.

1959. An ecological study of pollution in Los Angeles-Long Beach harbors, California. Allan Hancock Found., Occas. Pa., 22:1-119, 18 pls.

1963. A quantitative study of the benthic polychaetous annelids of Bahia de San Quintin, Baja California. Pacific Naturalist, 3:397-436, 16 figs.

REISH, D. J., and J. L. BARNARD

1960. Field toxicity tests in marine waters utilizing the polychaetous annelid *Capitella capitata* (Fabricius). Pacific Naturalist, 1(21):1-8, 5 figs.

SARS, G. O.

1885. Zoology. Crustacea, I. *In* Norwegian North-Atlantic Expedition 1876-1878, Christiania, 6:1-280, 21 pls., chart.

1895. Amphipoda. *In his* An Account of the Crustacea of Norway with short descriptions and figures of all the species, Christiania, Copenhagen, 1:i-viii, 1-711, 240 pls., 8 suppl. pls.

SCHELLENBERG, A.

1925. Crustacea, VIII: Amphipoda. *In* Michaelsen, W., ed. Beiträge zur Kenntnis der Meeresfauna Westafrikas, Hamburg, 3(4):113-204, 27 figs.

1926. Die Gammariden der deutschen Südpolar-Expedition 1901-1903. *In* Deutsche Südpolar-Exped., Berlin, 18:235-414, 68 figs.

1931. Gammariden und Caprelliden des Magellangebietes, Südgeorgiens und der Westantarktis. *In* Swedish Antarctic Exped. 1901-1903, Further Zool. Res., Stockholm, 2(6):1-290, 136 figs., 1 pl.

1942. Krebstiere oder Crustacea. IV: Flohkrebse oder Amphipoda. *In* Die Tierwelt Deutschlands, Jena, 40:1-252, 204 figs.

SHOEMAKER, C. R.

1925. The Amphipoda collected by the United States Fisheries Steamer 'ALBATROSS' in 1911, chiefly in the Gulf of California. Amer. Mus. Nat. Hist., Bull., 52(2):21-61, 26 figs.

1930. The Amphipoda of the Cheticamp Expedition of 1917. Canada, Biol. Bd., Contribs. to Canadian Biol., n. s. 5(10):1-141, 54 figs.

1931. The stegocephalid and ampeliscid amphipod crustaceans of Newfoundland, Nova Scotia, and New Brunswick in the United States National Museum. U. S. Natl. Mus., Proc., 79(2888):1-18, 6 figs.

1938. Two new species of amphipod crustaceans from the east coast of the United States. Washington Acad. Sci., Jour., 28:326-332, 2 figs.

1942. Amphipod crustaceans collected on the Presidential Cruise of 1938. Smithson. Miscell. Coll., 101(11):1-52, 17 figs.

1955a. Amphipoda collected at the Arctic Laboratory, Office of Naval Research, Point Barrow, Alaska, by G. E. MacGinitie. Smithson. Miscell. Coll., 128(1):1-78, 20 figs.

1955b. Notes on the amphipod genus *Maeroides thompsoni* Walker. Washington Acad. Sci., Jour., 45:59.

STEBBING, T. R. R.

1888. Report on the Amphipoda collected by H. M. S. Challenger during the years 1873-76. *In* Great Britain. Rpt of Sci. Res. of the Voyage of H. M. S. Challenger during the years 1873-76, Zool., Edinburgh, 29:i-xxiv, 1-1737, 210 pls.

1897. Amphipoda from the Copenhagen Museum and other sources. Linn. Soc. London, Trans., Zool., (2) 7:25-45, pls. 6-14.

1906. Amphipoda I. Gammaridea. *In* Das Tierreich, Berlin, 21:1-806, 127 figs.

1908. South African Crustacea (Part IV). So. African Mus., Ann., 6:1-96, 14 pls.

1910. Crustacea. Part 5. Amphipoda. (Sci. Res. Trawling Exped. of H. M. C. S. "Thetis". Part XII.) Australian Mus., Mem., 4, v. 2:565-658, pls. 47-60.

STEBBING, T. R. R., and D. ROBERTSON

1891. On four new British Amphipoda. Zool. Soc. London, Trans., 13:31-42, pls. 5-6.

STEPHENSEN, K.

1931a. Crustacea Malacostraca. VII. (Amphipoda. III.) *In* Danish Ingolf-Exped., Copenhagen, 3(11):179-290, figs. 54-81, charts 32-51.

1931b. On *Lepidepecreella cymba* (Goës), a gammarid amphipod from Spitsbergen. Ark. Zool., 22A(9):1-6, 2 figs.

1935. The Amphipoda of N. Norway and Spitsbergen with adjacent waters. TromsØ Mus., Skrifter, 3(1):1-140, 19 figs., charts.

1938. The Amphipoda of N. Norway and Spitsbergen with adjacent waters. TromsØ Mus., Skrifter, 3(2):141-278, figs. 20-31.

1940. Marine Amphipoda. Zoology of Iceland, 3(26):1-111, 13 figs.

1944. The Zoology of East Greenland. Amphipoda. Denmark. Medd. om GrØnland, 121(14): 1-165, 18 figs.

STOUT, V. R.

1913. Studies in Laguna Amphipoda. Zool. Jahrb., Syst., 34:633-659, 3 figs.

THORSON, G.

1957. Bottom communities (sublittoral or shallow shelf). *In* Natl. Res. Council, Treatise on Marine Ecology and Paleoecology, I, Ecology, ed. by J. W. Hedgpeth, New York. Geol. Soc. Amer., Mem., 67:461-534, 20 figs.

THORSTEINSON, E. D.

1941. New or noteworthy amphipods from the North Pacific Coast. Univ. Washington Publ. Oceanog., 4(2):50-96, 8 pls.

WALKER, A. O.

1898. Crustacea collected by W. A. Herdman, F. R. S., in Puget Sound, Pacific coast of North America, September, 1897. Liverpool Biol. Soc., Trans., 12:268-287, pls. 15-16.

1905. Marine Crustaceans. XVI. Amphipoda. *In* Gardiner, J. S., ed. Fauna and Geogr. of the Maldive and Laccadive Archs., Cambridge, Eng., 2, Suppl. 1:923-932, figs. 140-142, pl. 88.

ZENKEVITCH, L. A., and J. A. BIRSTEIN

1960. On the problem of the antiquity of the deep-sea fauna. Deep-Sea Research, 7:10-23, 1 fig.

# APPENDIX I

Depth distribution of the Amphipoda of submarine canyons of California, arranged in depth classes with lists of species and specimens.

## 15-100 m

*Acuminodeutopus heteruropus*, 7
*Ampelisca brevisimulata*, 23
*Ampelisca compressa*, 17
*Ampelisca cristata*, 32
*Ampelisca hancocki*, 5
*Ampelisca macrocephala*, 28
*Ampelisca milleri*, 1
*Ampelisca pacifica*, 1
*Ampelisca pugetica*, 12
*Amphideutopus oculatus*, 7
*Ampithoe mea*, 2
*Aoroides columbiae*, 197
*Byblis veleronis*, 2
*Ericthonius brasiliensis*, 4
*Eurystheus thompsoni*, 5
*Garosyrrhoe bigarra*, 1
*Heterophoxus oculatus*, 1
*Ischyrocerus pelagops*, 24
*Listriella eriopisa*, 3
*Listriella goleta*, 43
*Listriella melanica*, 7
*Lysianassa oculata*, 4
lysianassid, 1
*Megaluropus longimerus*, 1
*Megamphopus* sp., 2
*Melphisana bola*, 1
*Mesostenothoides bicoma*, 1
*Metaphoxus frequens*, 1
*Monoculodes hartmanae*, 3
*Monoculodes norvegicus*, 1
oedicerotid, 3
*Orchomene pacifica*, 1
*Pachynus barnardi*, 1
*Paraphoxus bicuspidatus*, 11
*Paraphoxus daboius*, 1
*Paraphoxus epistomus*, 65
*Paraphoxus fatigans*, 20
*Paraphoxus heterocuspidatus*, 3
*Paraphoxus lucubrans*, 4
*Paraphoxus obtusidens*, 41
*Paraphoxus similis*, 8
*Paraphoxus spinosus*, 19
*Paraphoxus stenodes*, 75
*Paraphoxus tridentatus*, 4
*Paraphoxus variatus*, 2
*Parapleustes pugettensis*, 89
*Photis bifurcata*, 9
*Photis brevipes*, 56
*Photis* sp., 148
*Prachynella lodo*, 1
*Protomedeia articulata*, 14
*Pseudokoroga rima*, 2
*Synchelidium rectipalmum*, 6
*Synchelidium shoemakeri*, 9
*Synchelidium* sp., 1
*Synchelidium* sp. G, 16
*Urothoe varvarini*, 6

## 101-200 m

*Ampelisca brevisimulata*, 7
*Ampelisca compressa*, 6
*Ampelisca hancocki*, 1
*Ampelisca macrocephala*, 72
*Ampelisca pacifica*, 10
*Anonyx carinatus*, 2
*Aoroides columbiae*, 4
*Atylus tridens*, 1
*Bathymedon roquedo*, 1
*Bruzelia tuberculata*, 1
*Byblis veleronis*, 1
*Dexamonica reduncans*, 4

*Dulichia* sp., 1
*Ericthonius brasiliensis*, 1
*Haploops spinosa*, 1
*Harpiniopsis fulgens*, 9
*Heterophoxus oculatus*, 118
*Hippomedon denticulatus*, 4
*Liljeborgia* sp., 5
*Listriella albina*, 3
*Listriella eriopisa*, 10
*Listriella goleta*, 4
*Lysianassa holmesi*, 2
*Lysianassa oculata*, 2
*Maera danae*, 30
*Melita dentata*, 1
*Metaphoxus frequens*, 114
*Metaphoxus fultoni*, 1
*Metopa* sp., 1
*Monoculodes emarginatus*, 2
*Monoculodes perditus*, 1
*Nicippe tumida*, 16
oedicerotid, 1
*Opisa tridentata*, 2
*Orchomene decipiens*, 34
*Orchomene pacifica*, 5
*Pachynus barnardi*, 12
*Paraphoxus bicuspidatus*, 107
*Paraphoxus epistomus*, 1
*Paraphoxus obtusidens*, 1
*Paraphoxus oculatus*, 4
*Paraphoxus robustus*, 9
*Paraphoxus similis*, 30
*Pardaliscella symmetrica*, 2
*Pardisynopia synopiae*, 5
*Photis brevipes*, 10
*Photis lacia*, 31
*Photis macrotica*, 4
*Photis* sp., 6
*Phoxocephalus homilis*, 67
*Podocerus cristatus*, 2
pontogeneiid, 1, (5114)
*Prachynella lodo*, 2
*Protomedeia articulata*, 3
*Protomedeia (?) prudens*, 1
*Sympleustes subglaber*, 2
*Synchelidium* sp., 1
*Syrrhoe* sp., 1
*Urothoe varvarini*, 2
*Westwoodilla caecula acutifrons*, 22

201-300 m

*Acidostoma hancocki*, 1
*Ampelisca compressa*, 3
*Ampelisca lobata*, 5
*Ampelisca macrocephala*, 25
*Ampelisca macrocephala unsocalae*, 26
*Ampelisca pacifica*, 16
*Ampelisca pugetica*, 7
*Ampelisca romigi*, 2
aorid, 1
*Aoroides columbiae*, 3
*Byblis veleronis*, 6
*Ceradocus spinicaudus*, 2
*Ericthonius hunteri*, 8
*Eurystheus thompsoni*, 1
*Harpiniopsis fulgens*, 11
*Heterophoxus oculatus*, 69
*Ischyrocerus* sp., 1
*Listriella albina*, 13
*Listriella eriopisa*, 4
*Listriella goleta*, 2
*Maera simile*, 22
*Mesometopa neglecta roya*, 4
*Mesostenothoides bicoma*, 1
*Metaphoxus frequens*, 5
*Metopella aporpis*, 3
*Microdeutopus schmitti*, 4
*Orchomene decipiens*, 2
*Pachynus barnardi*, 2
*Paraphoxus abronius*, 1

*Paraphoxus bicuspidatus*, 2
*Paraphoxus calcaratus*, 5
*Paraphoxus obtusidens*, 4
*Paraphoxus oculatus*, 6
*Paraphoxus robustus*, 3
*Paraphoxus spinosus*, 2
*Paraphoxus stenodes*, 2
*Pardaliscoides fictotelson*, 3
*Photis brevipes*, 4
*Photis macrotica*, 13
*Photis* sp., 1
*Phoxocephalus homilis*, 28
*Prachynella lodo*, 2
*Synchelidium* sp., 2
*Urothoe varvarini*, 6
*Westwoodilla caecula acutifrons*, 4
Unknown, 1

301-400 m

*Ampelisca compressa*, 1
*Ampelisca macrocephala*, 45
*Ampelisca macrocephala unsocalae*, 6
*Ampelisca pugetica*, 6
*?Aoroides columbiae*, 1
*Argissa hamatipes*, 1
*Byblis veleronis*, 1
*Ericthonius hunteri*, 2
*Gitanopsis vilordes*, 1
*Harpiniopsis emeryi*, 1
*Harpiniopsis epistomata*, 2
*Harpiniopsis fulgens*, 13
*Heterophoxus oculatus*, 33
*Listriella albina*, 8
*Listriella eriopisa*, 1
*Listriella goleta*, 3
*Maera danae*, 2
*Monoculodes latissimanus*, 5
*Nicippe tumida*, 4
*Pachynus barnardi*, 2
*Paraphoxus bicuspidatus*, 3
*Paraphoxus oculatus*, 4
*Paraphoxus robustus*, 1
*Paraphoxus spinosus*, 1
*Paraphoxus stenodes*, 2
*Phoxocephalus homilis*, 18
*Synchelidium* sp., 1
*Urothoe varvarini*, 1
Family?, 1

The 21 samples have only 170 specimens, 3 of the samples lacking amphipods, and none of them having more than 28 specimens. One would expect this body of samples to have large populations because of the medium grain-size of their sediments. This is almost exclusively a shallow water facies, except for the harpinias and the blind *Ampelisca m. unsocalae.*

401-500 m

*Ampelisca brevisimulata*, 2
*Ampelisca macrocephala*, 2
*Ampelisca macrocephala unsocalae*, 4
*Ampelisca pacifica*, 2
*Ampelisca pugetica*, 6
*Ampelisca romigi*, 2
*Byblis bathyalis*, 2
*Byblis ?veleronis*, 16
*Harpiniopsis epistomata*, 26
*Harpiniopsis fulgens*, 2
*Heterophoxus oculatus*, 9
*Leptophoxus falcatus icelus*, 1
*Liljeborgia cota*, 4
*Listriella goleta*, 1
*Megamphopus* sp., 2

*Melphidippa (?) amorita*, 1
*Metaphoxus frequens*, 5
*Paraphoxus bicuspidatus*, 1
*Paraphoxus calcaratus*, 99
*Paraphoxus daboius*, 1
*Paraphoxus obtusidens*, 48
*Pardisynopia synopiae*, 2
*Photis* spp., 94
*Phoxocephalus homilis*, 17
*Uristes californicus*, 2
*Urothoe varvarini*, 3

These 21 samples have 354 specimens, but 8 samples lacked amphipods. Essentially, this is a shallow water facies penetrated by some deep water species such as the blind subspecies of *Ampelisca macrocephala*, *Byblis bathyalis*, the harpinias, and *Liljeborgia*.

501-600 m

*Ampelisca coeca*, 1
*Ampelisca macrocephala unsocalae*, 6
*Bathymedon covilhani*, 2
*Byblis barbarensis*, 6
*Harpiniopsis epistomata*, 32
*Harpiniopsis fulgens*, 2
*Harpiniopsis naiadis*, 4
*Heterophoxus oculatus*, 2
*Liljeborgia cota*, 5
*Listriella albina*, 3
*Listriella eriopisa* aber., 1
*Monoculodes glyconica*, 1
*Paraphoxus epistomus*, 1
*Paraphoxus ?spinosus*, 1
*Proboloides tunda*, 2

These 19 samples, of which 9 samples lack amphipods, have 69 specimens. The high percentage of blank samples and low number of specimens perhaps is related to the oxygen minimum layer of the sea. This is a strongly mixed shallow and deep water fauna, especially dominated by *Harpiniopsis epistomata*.

601-700 m

*Acidostoma hancocki*, 2
*Ampelisca coeca*, 1
*Ampelisca ?compressa*, 3
*Ampelisca macrocephala*, 1
*Ampelisca macrocephala unsocalae*, 22
*Ampelisca romigi ciego*, 2
ampeliscid, 1
*Byblis barbarensis*, 2
*Byblis* cf. *veleronis*, 1
*Harpiniopsis emeryi*, 1
*Harpiniopsis epistomata*, 7
*Harpiniopsis fulgens*, 1
*Heterophoxus oculatus*, 2
*Liljeborgia cota*, 2
*Oediceropsis elsula*, 1
*Orchomene decipiens*, 1
*Paraphoxus oculatus*, 1
*Pardaliscella symmetrica*, 1
*Phoxocephalus homilis*, 1
*Proboloides tunda*, 7

These 17 samples have 60 specimens, with 6 samples lacking amphipods, probably because some are very near sill depths of San Pedro and Santa Monica basins (737 m). *Ampelisca macrocephala unsocalae* dominates the group. Species that are much deeper than their normal limits are *A. compressa,* of doubtful identification, *Proboloides tunda* and a deep water species that is near its shallow limits: *Ampelisca romigi ciego.*

701-800 m

*Ampelisca coeca*, 1
*Ampelisca macrocephala*, 1
*Ampelisca macrocephala unsocalae*, 4
*Bathymedon kassites*, 7
*Byblis barbarensis*, 4
*Byblis veleronis*, 1
*Harpiniopsis emeryi*, 1
*Harpiniopsis epistomata*, 16
*Harpiniopsis fulgens*, 5
*Heterophoxus oculatus*, 4
*Listriella albina*, 1
*Monoculodes norvegicus*, 1
*Orchomene decipiens*, 1
*Paraphoxus daboius*, 1
*Paraphoxus oculatus*, 1
*Protomedeia articulata*, 111

The 13 samples have 160 specimens; 5 samples lacked amphipods. This group of samples is dominated by the single Monterey Canyon station 6494 where 111 *Protomedeia articulata* were collected on a bottom heavy with eel-grass debris. Since that situation is not typical of canyons in southern California, additional calculations have been made in the tables in these depths to reflect the unusual population of *Protomedeia.* Otherwise, *Harpiniopsis epistomata* dominates the amphipods. Transition to deep bathyal is seen with the co-occurrence of *Ampelisca macrocephala* and its blind subspecies *A. m. unsocalae,* by the combination of *Byblis barbarensis* with *B. veleronis,* and the mixture of *Orchomene decipiens* and *Paraphoxus daboius* with other much deeper species such as *Ampelisca coeca.*

801-1000 m

*Ampelisca macrocephala unsocalae*, 14
*Ampelisca plumosa*, 2
*Ampelisca romigi ciego*, 2
*Byblis bathyalis*, 2
*Byblis* cf. *barbarensis*, 1
*Byblis tannerensis*, 3
*Harpiniopsis emeryi*, 2
*Harpiniopsis epistomata*, 4
*Harpiniopsis excavata*, 1
*Harpiniopsis naiadis*, 2
*Harpiniopsis profundis*, 1
*Heterophoxus oculatus*, 1
*Liljeborgia cota*, 1
*Oediceropsis morosa*, 1
*Paraphoxus daboius*, 9
*Paraphoxus oculatus*, 1
*Protomedeia articulata*, 20
*Schisturella zopa*, 3
*Tosilus arroyo*, 1
*Urothoe varvarini*, 3

These 9 samples, of which only one lacks amphipods, have 72 specimens. As in the 701-800 depth group, a Monterey sample is present with *Protomedeia articulata,* untypical of canyons in southern California. Otherwise, these samples are dominated by the blind subspecies of *Ampelisca macrocephala* and mixture is seen by the presence of *Paraphoxus daboius,* with the deep water harpinias, ampeliscas and byblises, the deep water species clearly dominating these depths.

1001-1620 m

ampeliscids, fragments, 2
*Harpiniopsis petulans*, 1
*Harpiniopsis profundis*, 1
*Metopa samsiluna*, 1
*Oediceropsis (Paroediceroides) trepadora*, 1
*Tryphosa index*, 1

Only one of these samples lacks amphipods, the other 4 bearing 7 specimens. These samples are most interesting because in their respective areas they are just above sill depths of San Clemente Basin or are in the Coronado Canyon. They are the deepest canyon samples above sill depths. Three of the species are new, so that the fauna reveals no relationship to either shallower depths of canyons or subsill faunas of basins.

# APPENDIX II

List of Californian borderland basins, their samples, depths in m, and Amphipoda. Station numbers are listed first, depths in parentheses and number of specimens in brackets.

Santa Barbara Basin: 3504 (493) [0], 3731 (503) [2], 3733 (558) [0], 3503 (581) [0], 4999 (618) [0]. *Byblis barbarensis*, 2.

Santa Monica Basin: 26 samples, all but one lacking Amphipoda. Added here to the 19 samples in Hartman and Barnard (1958, 1960) are these samples taken in canyons but below sill depths of basins: 6918 (Dume), 2474 (Redondo), 6913 (Mugu), 2139 (Redondo), 6777 (Santa Monica), 6776 (Santa Monica), 2403 (Redondo). *Liljeborgia cota*, 1.

San Pedro Basin: Samples with Amphipoda are: 2410 (750), 2636 (754), 2440 (760), 2343 (765), 2335 (769), 2439 (796), 2229 (805), 7497 (833), and 66 samples lacking Amphipoda from depths of 750 to 906 m; 53 of the samples lacking Amphipoda exceed 796 m. *Ampelisca coeca*, 1, *Ampelisca macrocephala*, 3, *Ampelisca pugetica*, 3, *Harpiniopsis epistomata*, 29, *Heterophoxus oculatus*, 1, *Liljeborgia cota*, 1, *Monoculodes norvegicus*, 1, *Urothoe varvarini*, 1.

Santa Catalina Basin: 3026 (1016) [0], 2846 (1120) [2], 2850 (1135) [14], 4742 (1195) [0], 5935 (1225) [3], 2169 (1251) [2], 2130 (1260) [1], 6828 (1272) [5], 2849 (1282) [3], 3025 (1298) [0], 2848 (1305) [0], 5104 (1330) [0]. *Ampelisca eoa*, 2, *Byblis barbarensis*, 2, *Harpiniopsis emeryi*, 3, *Harpiniopsis excavata*, 2, *Harpiniopsis profundis*, 1, *Heterophoxus oculatus*, 5, *Leptophoxus falcatus icelus*, 3, *Liljeborgia cota*, 2, *Nicippe tumida*, 1, *Paraphoxus oculatus*, 2, stenothoid, 1, (2850), ?genus, 3, (2850), 2, (2169), 1, (2849).

Santa Cruz Basin: 6810 (1387) [3], 5925 (1411) [9], 3029 (1514) [1], 5928 (1520) [0], 6811 (1624) [0], 5930 (1785) [5], 3028 (1788) [2], 5929 (1850) [0], 3027 (1918) [3], 5927 (2030) [0], 5926 (2080) [1]. *Ampelisca* sp., 3, *Bathymedon covilhani*, 1, *Harpiniopsis epistomata*, 6, *Harpiniopsis emeryi*, 1, *Harpiniopsis fulgens*, 2, *Heterophoxus oculatus*, 10, *Nicippe tumida*, 1.

Tanner Basin: 6348 (1292) [9], 6832 (1298) [10], 6347 (1414) [4], 6346 (1481) [4], 6345 (1486) [0], 5120 (1527) [0], 6344 (1533) [2]. *Ampelisca eoa*, 2, *Ampelisca macrocephala unsocalae*, 3, *Ampelisca amblyopsoides*, 3, *Bathymedon covilhani*, 1, *Bonnierella linearis californica*, 1, *Harpiniopsis fulgens*, 5, *Harpiniopsis similis hondanada*, 2, *Harpiniopsis* spp., 2, *Heterophoxus oculatus*, 3, *Liljeborgia cota*, 3, *Sophrosyne robertsoni*, 2, *Urothoe varvarini*, 2.

San Nicolas Basin: 6336 (1227) [3], 6337 (1245) [0], 6342 (1551) [2], 6339 (1608) [3], 5931 (1609) [0], 6341 (1670) [2], 6340 (1731) [2], 6338 (1735) [6], 6343 (1747) [1], 5933 (1749) [5], 5116 (1796) [0]. *Bonnierella linearis californica*, 1, *Byblis* sp., 2, *Harpiniopsis emeryi*, 1, *Harpiniopsis fulgens*, 4, *Heterophoxus oculatus*, 8, *Hirondellea fidenter*, 1, *Liljeborgia cota*, 1, ?*Orchomene* sp., 1, *Pardaliscella symmetrica*, 5.

San Clemente Basin: 6089 (2036) [1], 4669 (2059) [3], 6091 (2070) [1], 5945 (2089) [1], 6092 (2100) [3], 5946 (2124) [1]. *Byblis* sp., 2, *Harpiniopsis emeryi*, 1, *Harpiniopsis fulgens*, 1, *Harpiniopsis profundis*, 1, *Harpiniopsis* sp., 1, *Heterophoxus oculatus*, 1, *Lepidepecreella charno*, 1, *Phoxocephalus homilis*, 1, Unknown, 1.

East Cortes Basin: 5944 (1797) [0], 5943 (1801) [7], 5942 (1872) [1]. *Ampelisca* spp., 2, *Coxophoxus hidalgo*, 6.

West Cortes Basin: 4675 (1487) [0], 5939 (1668) [0], 5940 (1923) [2], 5941 (1924) [1]. *Ampelisca* sp., 1, *Byblis* sp., 1, *Harpiniopsis* sp., 1.

Long Basin: 6351 (1821) [9], 6350 (1833) [1], 6349 (1961) [0]. *Ampelisca eoa*, 1, *Ampelisca plumosa*, 3, *Harpiniopsis fulgens*, 4, *Liljeborgia cota*, 1, Unknown, 1.

Velero Basin: 5947 (2276) [0], 5948 (2580) [0].

Patton Escarpment: 5937 (1426) [5], 5938 (1760) [11]. *Ampelisca eoa*, 4, *Ampelisca macrocephala unsocalae*, 2, *Ampelisca plumosa*, 4, *Bruzelia ascua*, 1, *Haploops* sp., 1, *Harpiniopsis* sp., 1, ?*Harpinioides* sp., 1, *Leptophoxus falcatus icelus*, 1, ?*Pardaliscella* sp., 1.

# APPENDIX III

Distribution of the submarine canyon samples with depth, their sediments and Amphipoda.

Canyon symbols are: Ca=Santa Catalina; Cl=San Clemente; Co=Coronado; D=Dume; H=Hueneme; J=La Jolla; Mo=Santa Monica; Mt=Monterey; Mu=Mugu; N=Newport; R=Redondo; S=San Pedro sea valley; SD=San Diego trough; T=Tanner; Z=Santa Cruz.

| Sample | Canyon | Depth, m | Distance Above Axis, m | Median Diameter, mm | Percent Sand | No. of Amphipoda |
|---|---|---|---|---|---|---|
| 4852 | Mu | 15 | 105 | .110 | 94 | 671 |
| C 7031 | N | 16 | 0 | .046 | 44 | 21 |
| 5006 | N | 37 | ...... | ...... | .... | 12 |
| 5250 | N | 37 | 0 | .055 | 48 | 1 ($H_2S$) |
| C 7044 | J | 79 | 0 | .077 | 72 | 20 |
| C 7030 | N | 85 | 3 | .022 | 9 | 11 |
| C 6803 | Z | 89 | 0 | .268 | 93 | 249 |
| 5367 | N | 97 | ...... | ...... | .... | 74 |
| 2725 | R | 107 | ...... | ...... | .... | 25 |
| 2192 | R | 113 | ...... | ...... | .... | 13 |
| C 6781 | Mo | 116 | 0 | .233 | 14/70 | 21 |
| C 6902 | Mu | 119 | 0 | 1.986 | 29/53 | 0 |
| 3385 | R | 120 | 430 | .042 | 17 | 126 |
| C 7038 | J | 121 | 200 | .041 | 35 | 62 |
| 2727 | R | 122 | 430 | .058 | 47 | 49 |
| C 6846 | Co | 123 | 9 | .072 | 66 | 60 |
| C 7043 | J | 135 | 0 | .144 | 94 | 6 |
| C 7284 | R | 137 | 0 | .031 | 17 | 9 |
| 5661 | N | 140 | ...... | ...... | .... | 0 |
| 5960 | R | 146 | 400 | .072 | 62 | 116 |
| 3164 | R | 148 | 0 | .039 | 36 | 1 |
| 5114 | H | 165 | 20 | .128 | 89 | 8 |
| C 6499 | Mt | 168 | ...... | ...... | .... | 41 |
| 7029 | N | 170 | 4 | .026 | 5 | 25 |
| 4851 | Mu | 171 | 325 | .042 | 41 | 119 |
| 5531 | H | 177 | ...... | ...... | .... | 6 |
| C 6845 | Co | 177 | 2 | .046 | 38 | 105 |
| C 7054 | N | 178 | 91 | .041 | 32 | 22 |
| 5688 | H | 183 | ...... | ...... | .... | 0 |
| C 6780 | Mo | 183 | 0 | .102 | 70 | 1 |

| Sample | Canyon | Depth, m | Distance Above Axis, m | Median Diameter, mm | Percent Sand | No. of Amphipoda |
|---|---|---|---|---|---|---|
| C 6854 | S | 187 | 0 | .013 | 18 | 18 |
| 4846 | H | 209 | 0 | .031 | 9 | 2 |
| C 6822 | Ca | 216 | 0 | .029 | 7 | 13 |
| C 6805 | Z | 218 | ...... | ...... | .... | 41 |
| C 6806 | Z | 221 | 120 | ...... | .... | 108 |
| C 7174 | S | 221 | 200 | .047 | 47 | 52 |
| 2358 | R | 229 | ...... | ...... | .... | 0 |
| 2191 | R | 232 | ...... | ...... | .... | 21 |
| C 7730 | N | 236 | ...... | ...... | .... | 4 |
| 2149 | R | 239 | ...... | ...... | .... | 3 |
| C 7285 | R | 246 | 0 | .015 | 5 | 9 |
| C 6498 | Mt | 260 | ...... | ...... | .... | 3 |
| C 6821 | Ca | 266 | ...... | ...... | .... | 18 |
| 3000 | Mo | 268 | ...... | ...... | .... | 7 |
| C 6896 | H | 271 | 16 | .051 | 45 | 0 |
| C 7028 | N | 272 | 0 | .024 | 30 | 0 |
| C 7045 | J | 274 | 11 | .095 | 88 | 6 |
| C 6815 | R | 282 | 86 | .027 | 24 | 25 |
| 2148 | R | 298 | ...... | ...... | .... | 4 |
| C 6835 | T | 298 | 0 | .218 | 99 | 27 |
| C 6915 | D | 299 | 0 | .014 | 11 | 31 |
| C 6501 | S | 319 | ...... | ...... | .... | 2 |
| 3180 | Mo | 330 | 0 | .043 | 37 | 6 |
| C 6897 | H | 338 | 9 | .095 | 65 | 11 |
| 2190 | R | 344 | ...... | ...... | .... | 4 |
| C 6849 | Co | 344 | 9 | .005 | 1 | 28 |
| C 6903 | Mu | 352 | 0 | .029 | 35 | 6 |
| C 6909 | Mu | 352 | 230 | .014 | 5/7 | 14 |
| 3179 | Mo | 362 | 50 | .038 | 20 | 4 |
| C 6818 | Ca | 362 | 37 | .028 | 17 | 6 |
| 3166 | R | 363 | 5 | .029 | 33 | 4 |
| C 7039 | J | 371 | 13 | .095 | 92 | 8 |
| 5115 | H | 373 | ...... | ...... | .... | 3 |
| C 6898 | H | 373 | 46 | .018 | 5 | 37 |
| 5505 | D | 374 | ...... | ...... | .... | 7 |
| 5686 | H | 374 | ...... | ...... | .... | 0 |
| 5532 | H | 376 | 0 | .032 | 16 | 3 |
| C 6816 | R | 378 | 8 | .051 | 36 | 1 |
| C 7286 | R | 378 | 0 | .044-.062 | 40-53 | 1 |

| Sample | Canyon | Depth, m | Distance Above Axis, m | Median Diameter, mm | Percent Sand | No. of Amphipoda |
|---|---|---|---|---|---|---|
| C 6819 | Ca | 379 | 0 | .031 | 16 | 19 |
| C 7053 | N | 396 | 0 | .088 | 60 | 0 |
| 5046 | D | 398 | ...... | ...... | .... | 5 |
| C 7160 | S | 406 | 100 | .019-.082 | 15-57 | 0 |
| C 6497 | Mt | 410 | ...... | ...... | .... | 6 |
| C 7052 | N | 420 | 58 | .036 | 16 | 0 |
| 2189 | R | 422 | ...... | ...... | .... | 2 |
| C 7154 | S | 426 | ...... | ...... | .... | 3 |
| 3178 | Mo | 431 | 70 | .010 | 10 | 0 |
| C 7287 | R | 431 | 0 | .029-.038 | 29-38 | 0 |
| 2219 | S | 437 | ...... | ...... | .... | 6 |
| 2999 | Mo | 454 | 105 | .035 | 14 | 1 |
| C 6899 | H | 456 | 9 | .165 | 36/52 | 9 |
| 2218 | S | 459 | ...... | ...... | .... | 0 |
| C 6804 | Z | 459 | 0 | .250 | 90 | 252 |
| 5639 | S | 461 | ...... | ...... | .... | 0 |
| 3399 | Mo | 463 | 190 | .042 | 14 | 0 |
| 2793 | R | 465 | 125 | .038 | 36 | 3 |
| C 7155 | S | 468 | 150 | ...... | .... | 0 |
| C 6779 | Mo | 475 | 0 | .125 | 63 | 18 |
| C 6904 | Mu | 475 | 0 | .268 | 6/89 | 1 |
| C 6900 | H | 478 | 11 | .022 | 11 | 3 |
| C 7032 | N | 478 | 2 | .038 | 36 | 11 |
| C 6836 | T | 496 | 11 | ...... | .... | 54 |
| 7288 | R | 503 | 0 | .062 | 50 | 20 |
| 5674 | D | 507 | ...... | ...... | .... | 1 |
| C 7046 | J | 517 | 0 | .074 | 72 | 0 |
| 3167 | R | 519 | 40 | .043 | 40 | 1 |
| 2317 | S | 522 | ...... | ...... | .... | 1 |
| C 6916 | D | 530 | 15 | .022 | 15 | 20 |
| 2151 | R | 542 | ...... | ...... | .... | 0 |
| 3177 | Mo | 542 | 30 | .016 | 6 | 0 |
| C 7041 | J | 545 | 90 | .010 | 3 | 2 |
| C 6502 | S | 547 | ...... | ...... | .... | 0 |
| C 6910 | Mu | 548 | 35 | .024 | 15 | 0 |
| C 6831 | Ca | 549 | 190 | .019 | 4 | 5 |
| C 7051 | N | 553 | 0 | .116 | 87 | 4 |
| 3168 | R | 554 | 35 | .043 | 35 | 0 |
| C 6820 | Ca | 559 | 0 | .040 | 40 | 10 |

| Sample | Canyon | Depth, m | Distance Above Axis, m | Median Diameter, mm | Percent Sand | No. of Amphipoda |
|---|---|---|---|---|---|---|
| C 7289 | R | 560 | 0 | .353 | 95 | 5 |
| C 6852 | Co | 566 | 29 | .005-.036 | 6-32 | 0 |
| 2150 | R | 575 | ------ | ------ | ---- | 0 |
| C 6778 | Mo | 583 | 15 | .044 | 41 | 0 |
| 2723 | R | 602 | ------ | ------ | ---- | 0 |
| C 6834 | T | 603 | 13 | .062 | 62 | 3 |
| C 7290 | R | 611 | 0 | .036 | 25 | 6 |
| 3176 | Mo | 612 | 30 | .009 | 2 | 1 |
| C 6901 | H | 621 | 2 | .154 | 90 | 0 |
| C 6809 | Z | 623 | 350 | 3.46 | 88 | 10 |
| C 7404 | SD | 626 | ------ | ------ | ---- | 0 |
| C 7040 | J | 637 | 0 | .103 | 92 | 0 |
| C 7050 | N | 642 | 0 | ------ | ---- | 1 |
| C 6837 | T | 644 | 53 | .053 | 67 | 9 |
| C 6911 | Mu | 644 | 0 | .072 | 61 | 15 |
| 5676 | D | 652 | ------ | ------ | ---- | 1 |
| C 6503 | S | 661 | ------ | ------ | ---- | 0 |
| 2336 | S | 666 | ------ | ------ | ---- | 0 |
| C 7403 | SD | 672 | ------ | ------ | ---- | 1 |
| C 6812 | Z | 676 | 400 | .054 | 49 | 12 |
| 2475 | R | 686 | ------ | ------ | ---- | 1 |
| C 7402 | SD | 703 | ------ | ------ | ---- | 1 |
| C 6830 | Ca | 708 | 9 | ------ | ---- | 2 |
| C 7048 | J | 708 | 90 | .007 | 1 | 0 |
| C 6917 | D | 711 | 0 | .013 | 11 | 0 |
| 2476 | R | 715 | ------ | ------ | ---- | 0 |
| C 6861 | S | 716 | 0 | .011 | 9 | 0 |
| C 6912 | Mu | 721 | 0 | .051 | 35 | 2 |
| 6494 | Mt | 750 | ------ | ------ | ---- | 120 |
| 7396 | SD | 769 | ------ | ------ | ---- | 7 |
| C 7399 | SD | 772 | ------ | ------ | ---- | 1 |
| C 7395 | SD | 773 | ------ | ------ | ---- | 2 |
| C 7728 | SD | 786 | ------ | ------ | ---- | 9 |
| C 7047 | J | 793 | 0 | .062 | 53 | 16 |
| C 6851 | Co | 812 | 5 | .022 | 5 | 4 |
| C 6833 | T | 813 | 7 | .134 | 93 | 35 |
| C 6829 | Ca | 853 | 27 | ------ | ---- | 0 |
| C 6808 | Z | 902 | 0 | .028-.047 | 31-46 | 2 |
| C 6490 | Mt | 906 | ------ | ------ | ---- | 20 |

| Sample | Canyon | Depth, m | Distance Above Axis, m | Median Diameter, mm | Percent Sand | No. of Amphipoda |
|---|---|---|---|---|---|---|
| C 2847 | Ca | 914 | ...... | ...... | .... | 6 |
| C 6838 | Cl | 950 | 7 | ...... | .... | 3 |
| C 6850 | Co | 960 | 9 | .032 | 31 | 1 |
| C 7049 | J | 976 | 0 | .011-.102 | 4-82 | 5 |
| C 6844 | Co | 1105 | 17 | .017-.044 | 12-41 | 1 |
| C 6842 | Co | 1265 | 0 | .041 | 40 | 1 |
| C 6839 | Cl | 1406 | 0 | .203 | 91 | 3 |
| C 6841 | Cl | 1591 | 250 | ...... | .... | 0 |
| C 6840 | Cl | 1620 | 186 | ...... | .... | 2 |

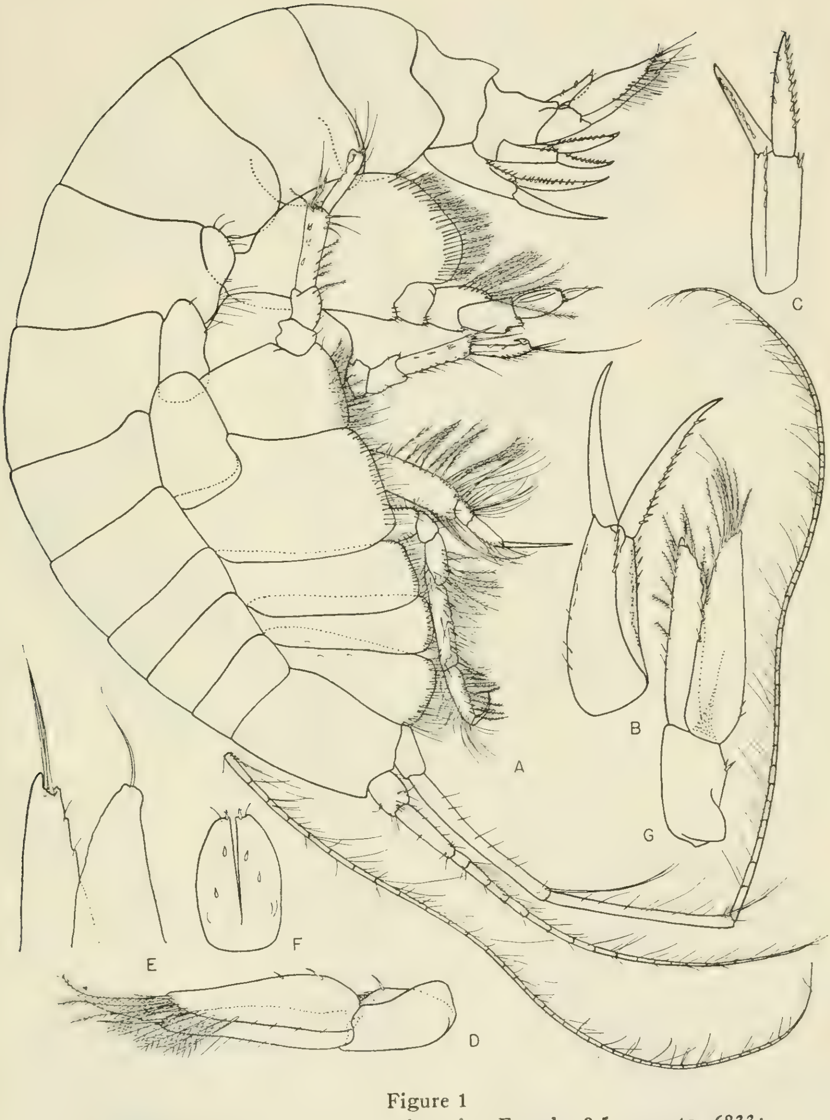



Figure 1

*Ampelisca romigi ciego*, new subspecies. Female, 9.5 mm, sta. 6833: A, lateral view; B,C,D, uropods 1, 2, 3; E, ends of rami of uropod 3; F, telson; G, uropod 3.

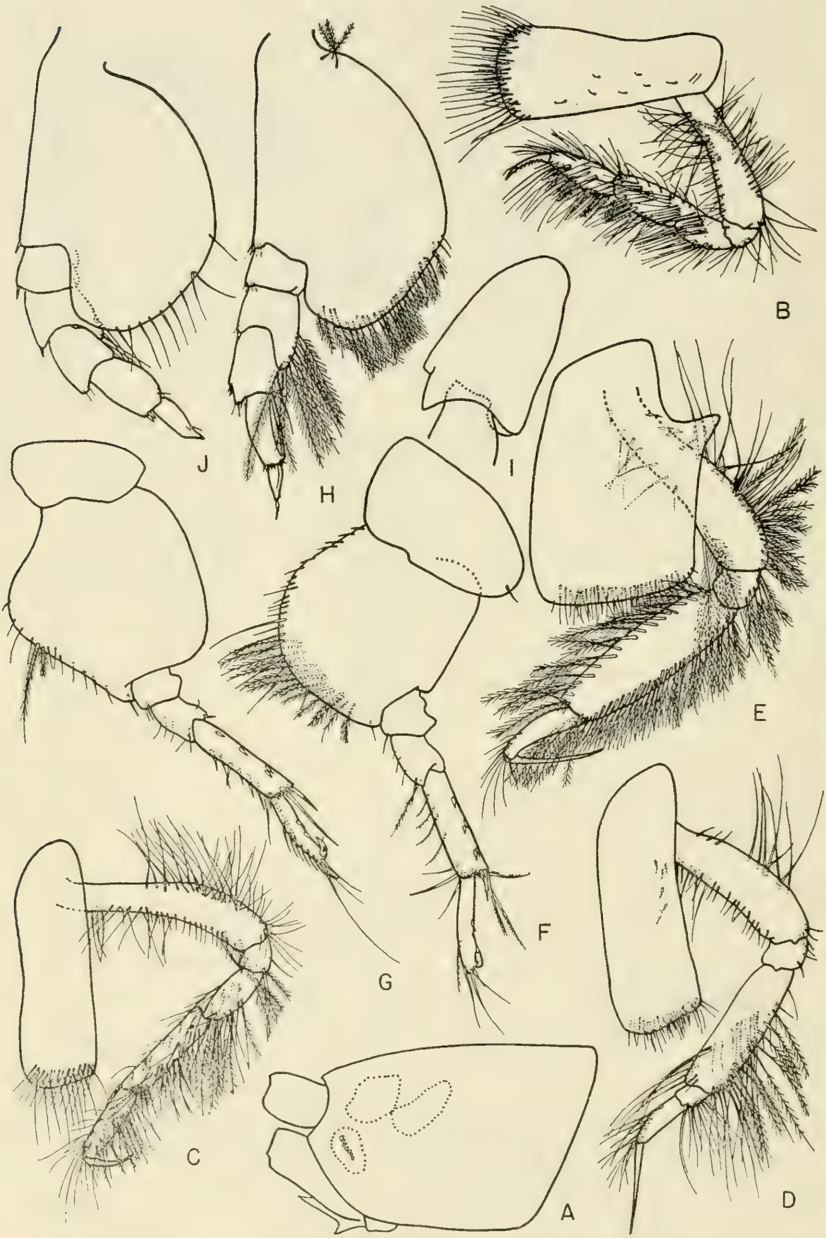



Figure 2
*Ampelisca romigi ciego*, new subspecies. Female, 9.5 mm, sta. 6833: A, head; B,C, gnathopods 1, 2; D,E,F,G,H, pereopods 1, 2, 3, 4, 5; I, article 5 of pereopod 5. Juvenile, 4.0 mm: J, pereopod 5.

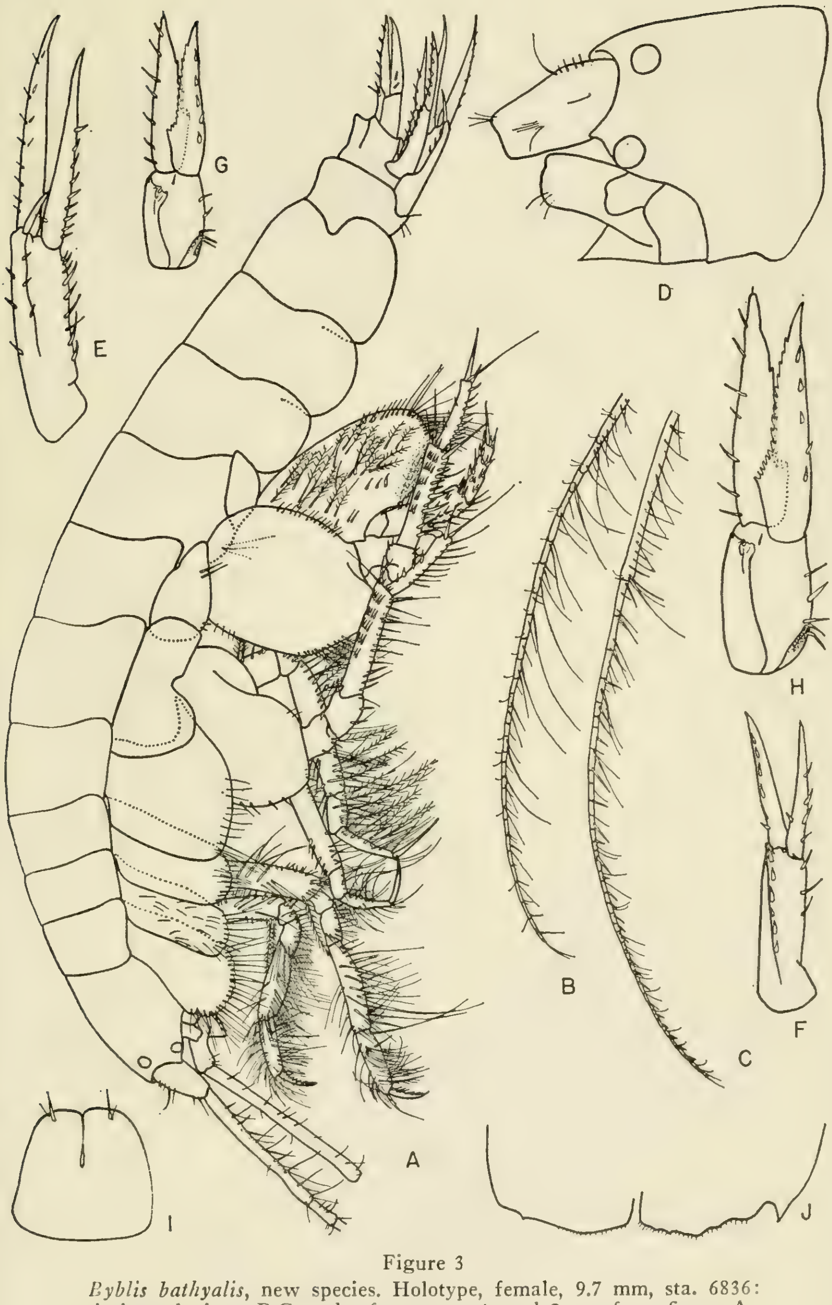



Figure 3

*Byblis bathyalis*, new species. Holotype, female, 9.7 mm, sta. 6836: A, lateral view; B,C, ends of antennae 1, and 2, cut from figure A; D, head; E,F,G,H, uropods 1, 2, 3, 3; I, telson; J, end of telson.


Figure 4

*Byblis bathyalis*, new species. Holotype, female, 9.7 mm, sta. 6836: A,B, gnathopods 1, 2,; C,D,E,F,G, pereopods 1, 2, 3, 4, 5.


Figure 5
*Byblis tannerensis*, new species. Holotype, female, 9.5 mm, sta. 6833: A, lateral view; B,C,D,E, uropods 1, 2, 3, 3; F, telson.

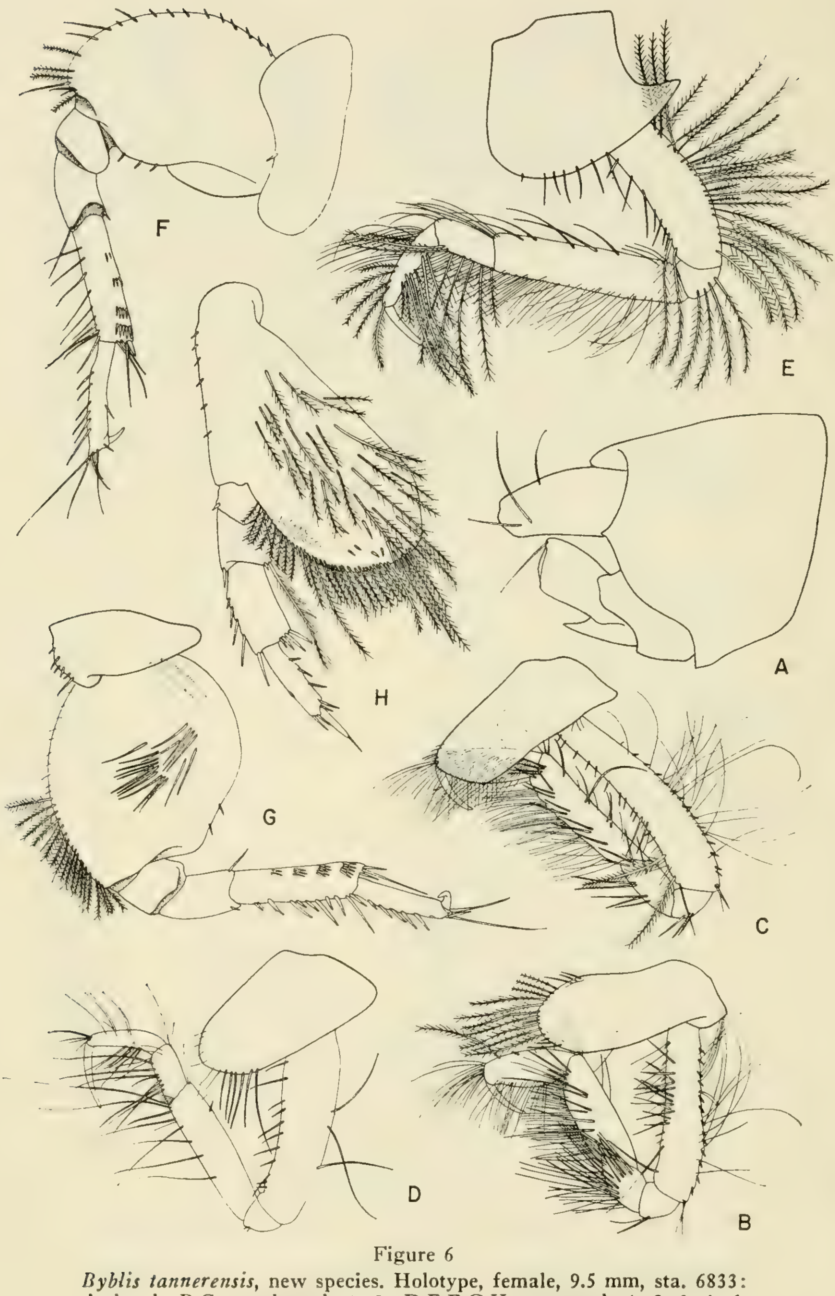



Figure 6
*Byblis tannerensis*, new species. Holotype, female, 9.5 mm, sta. 6833: A, head; B,C, gnathopods 1, 2; D,E,F,G,H, pereopods 1, 2, 3, 4, 5.

Figure 7
*Haploops spinosa* Shoemaker. Female, 9.0 mm, sta. 6002.

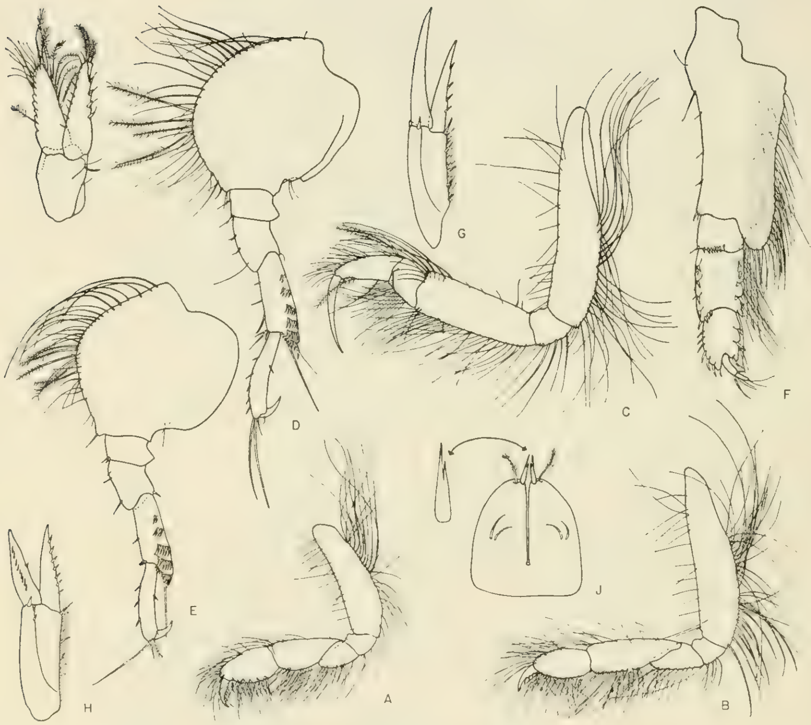



Figure 8
*Haploops spinosa* Shoemaker. Female, 9.0 mm, sta. 6002: A,B, gnathopods 1, 2; C,D,E,F, pereopods 2, 3, 4, 5; G,H,I, uropods 1, 2, 3; J, telson.

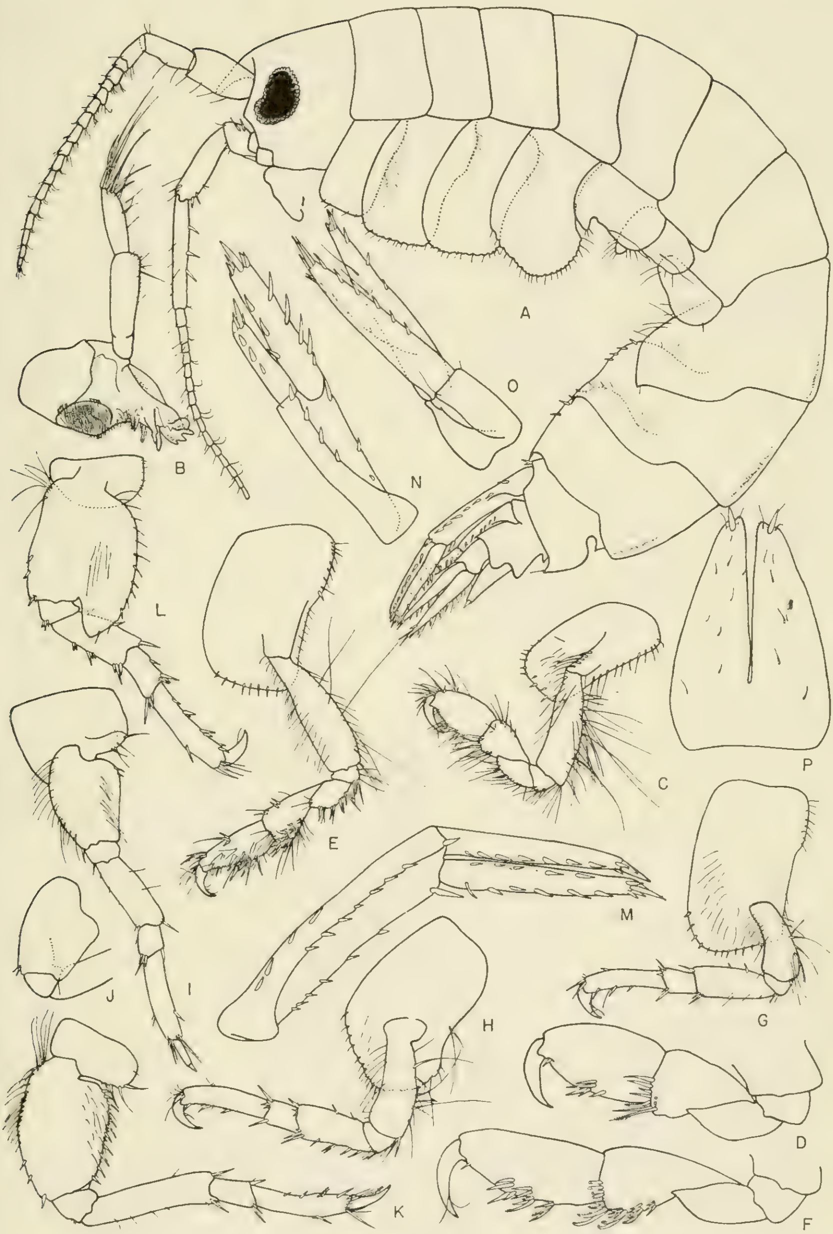



Figure 9

*Atylus tridens* (Alderman). Female, 6.0 mm, sta. 7043: A, lateral view, less legs; B, mandible; C,D, gnathopod 1 medial views; E,F, gnathopod 2, medial views; G,H,I,K,L, pereopods 1, 2, 3, 4, 5; J, pereopod 3 of other side of animal; M,N,O, uropods 1 2, 3; P, telson.

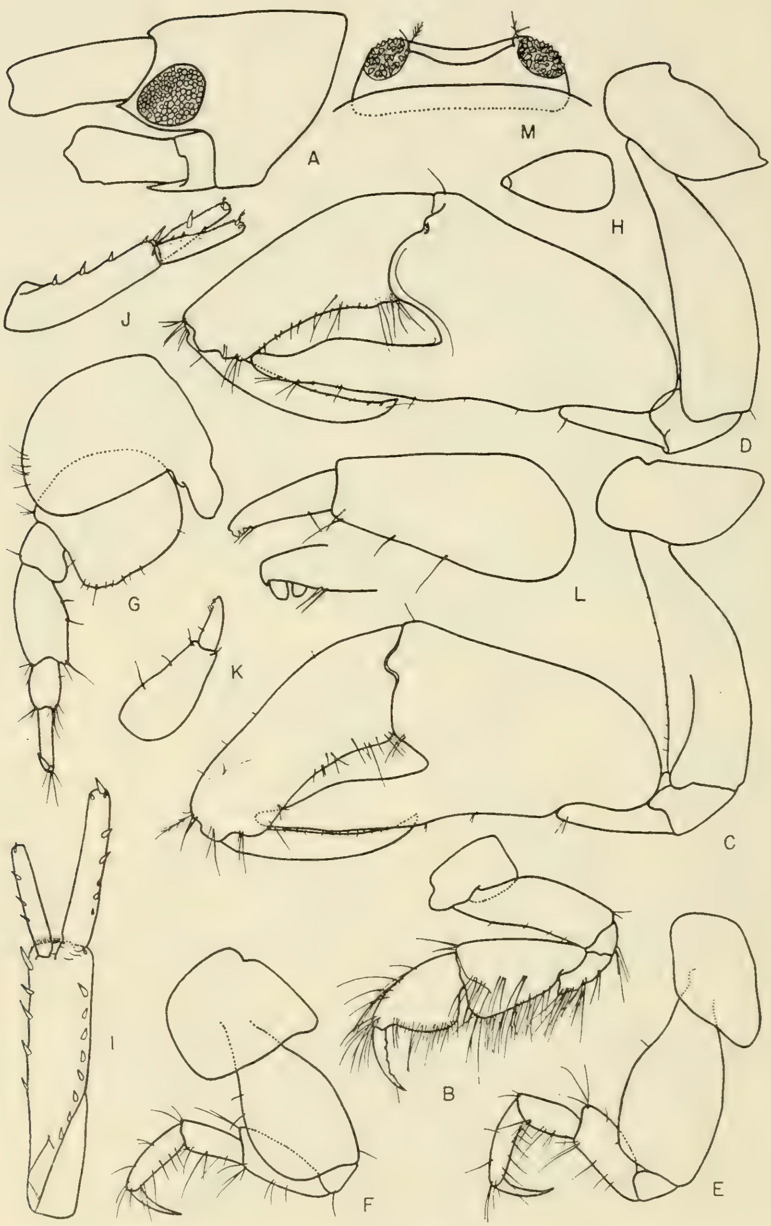



Figure 10

*Ericthonius ?difformis* Milne Edwards. Male, 7.5 mm, sta. 6909: A, head; B, gnathopod 1; C,D, gnathopod 2; E,F,G, pereopods 1, 2, 3; H, scale of telson; I,J,K,L, uropods 1, 2, 3, 3; M, telson.

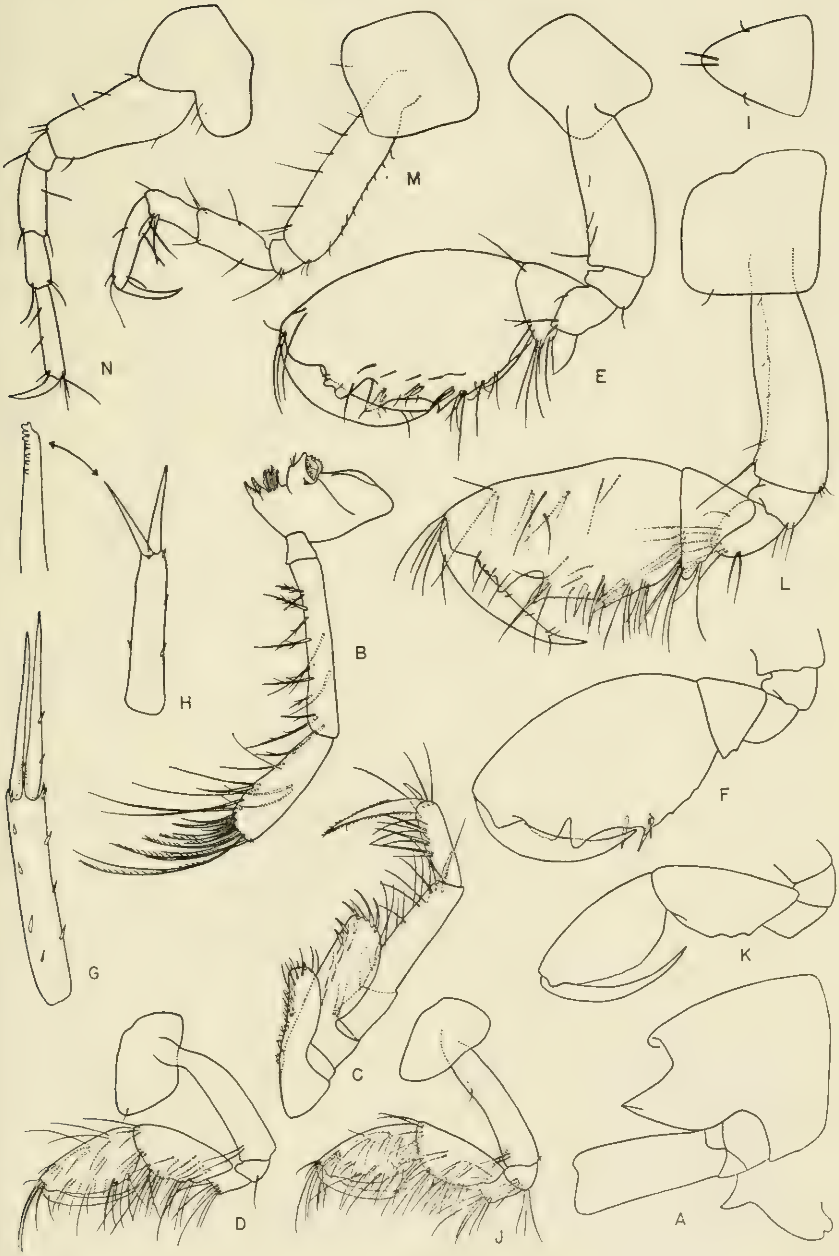



Figure 11

*Bonnierella linearis californica*, new subspecies. Holotype, male, 3.0 mm, sta. 6348: A, head and epistome-upper lip complex; B, mandible; C, maxilliped; D, gnathopod 1; E,F, gnathopod 2, medial and lateral views; G, uropod 1; H, uropod 3, with enlargement of outer ramus; I, telson. Female, 2.75 mm, sta. 6839: J,K, gnathopod 1; L, gnathopod 2; M,N, pereopods 1, 3.

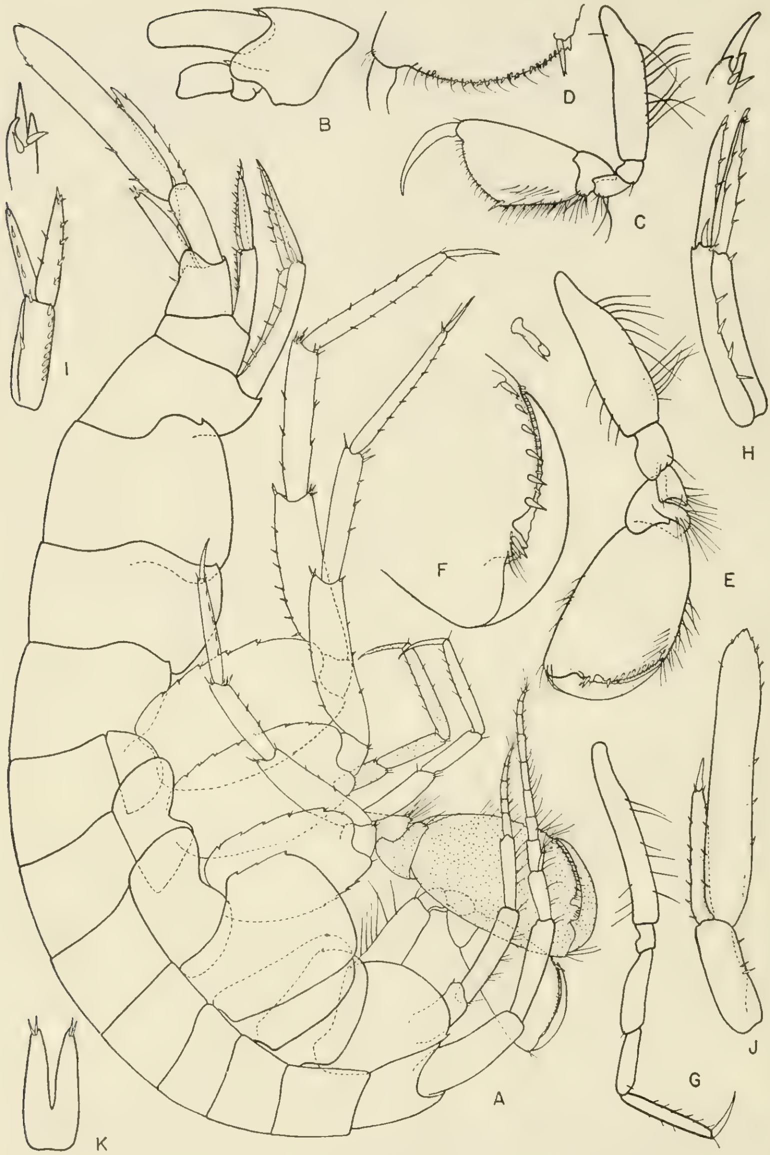



Figure 12

*Listriella albina* J. L. Barnard. Male, 5.4 mm, sta. 7288: A, lateral view; B, head; C,D, gnathopod 1; E,F, gnathopod 2; G, pereopod 1; H,I,J, uropods 1, 2, 3; K, telson.

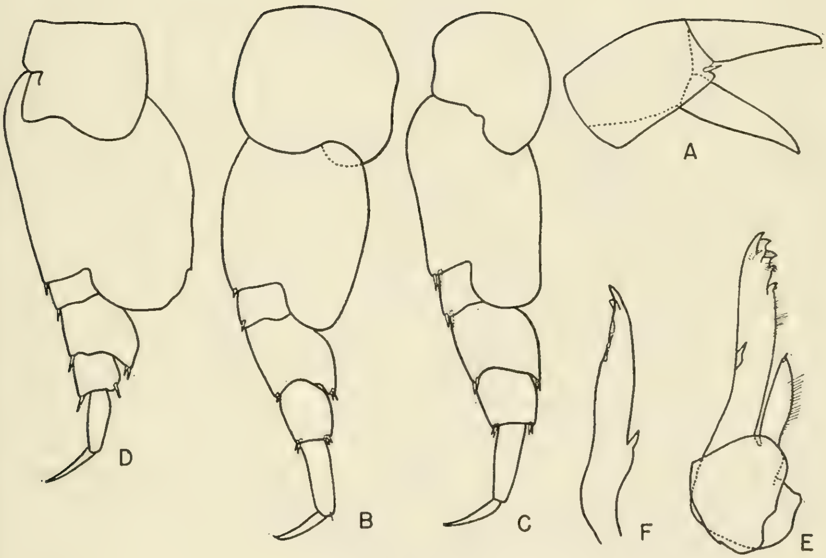



Figure 13
*Acidostoma hancocki* Hurley. Juvenile, 1.8 mm, sta. 6837: A, uropod 2; B,C,D, pereopods 3, 4, 5; E,F, maxilla 1.

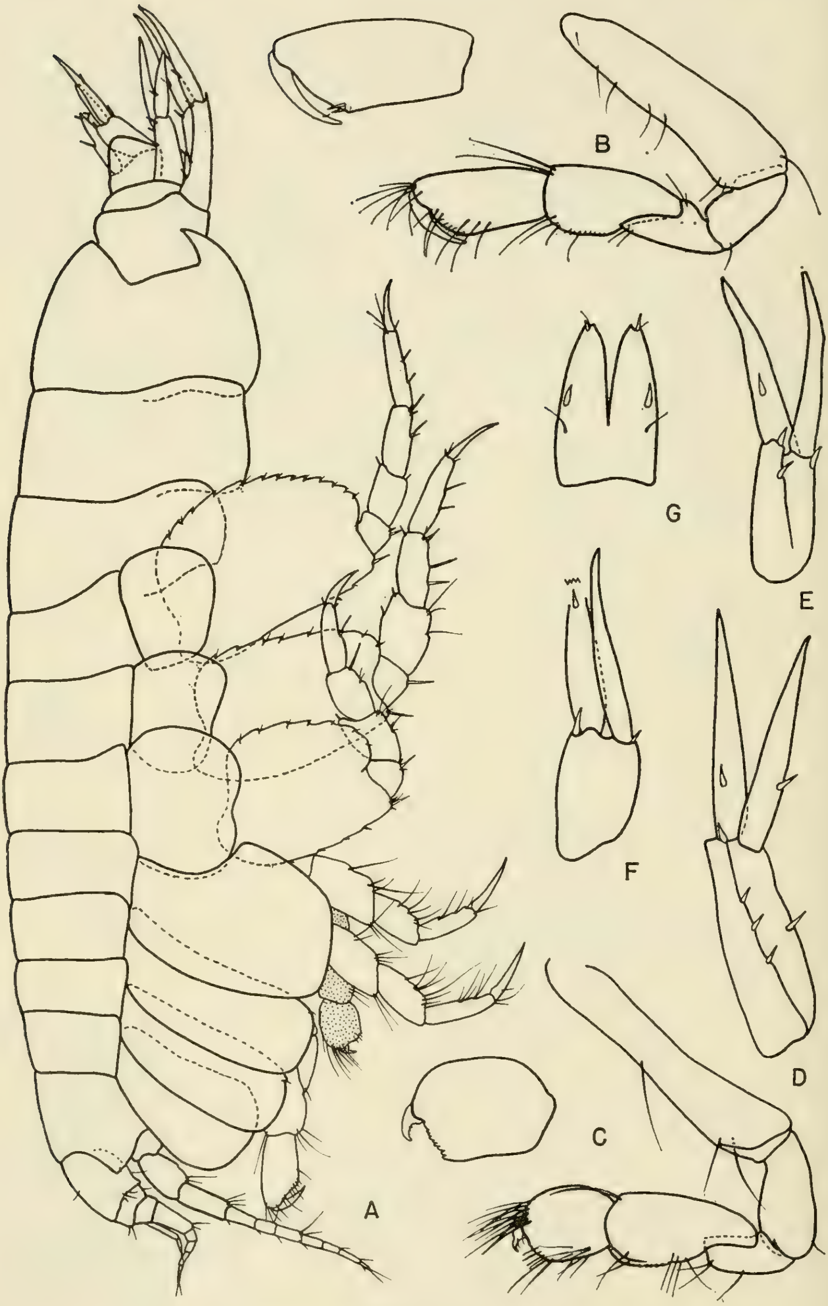



Figure 14
*Hippomedon tenax*, new species. Male, 4.0 mm, sta. 5828: A, lateral view; B,C, gnathopods 1, 2; D,E,F, uropods 1, 2, 3; G, telson.

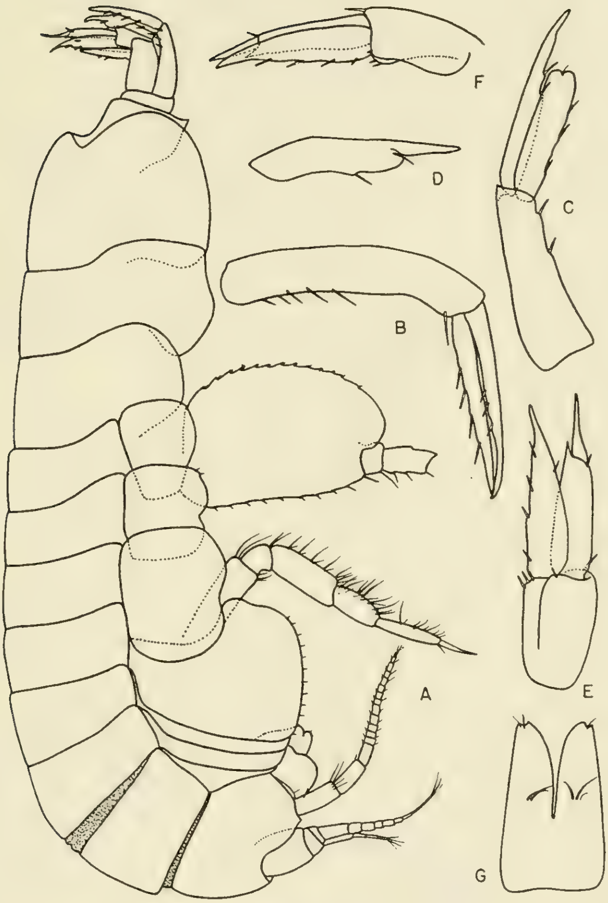



Figure 15
*Hirondellea fidenter*, new species. Male, 4.7 mm, sta. 6336: A, lateral view minus uropod 1; B,C, uropods 1, 2; D, inner ramus of uropod 2; E,F, uropod 3; G, telson.

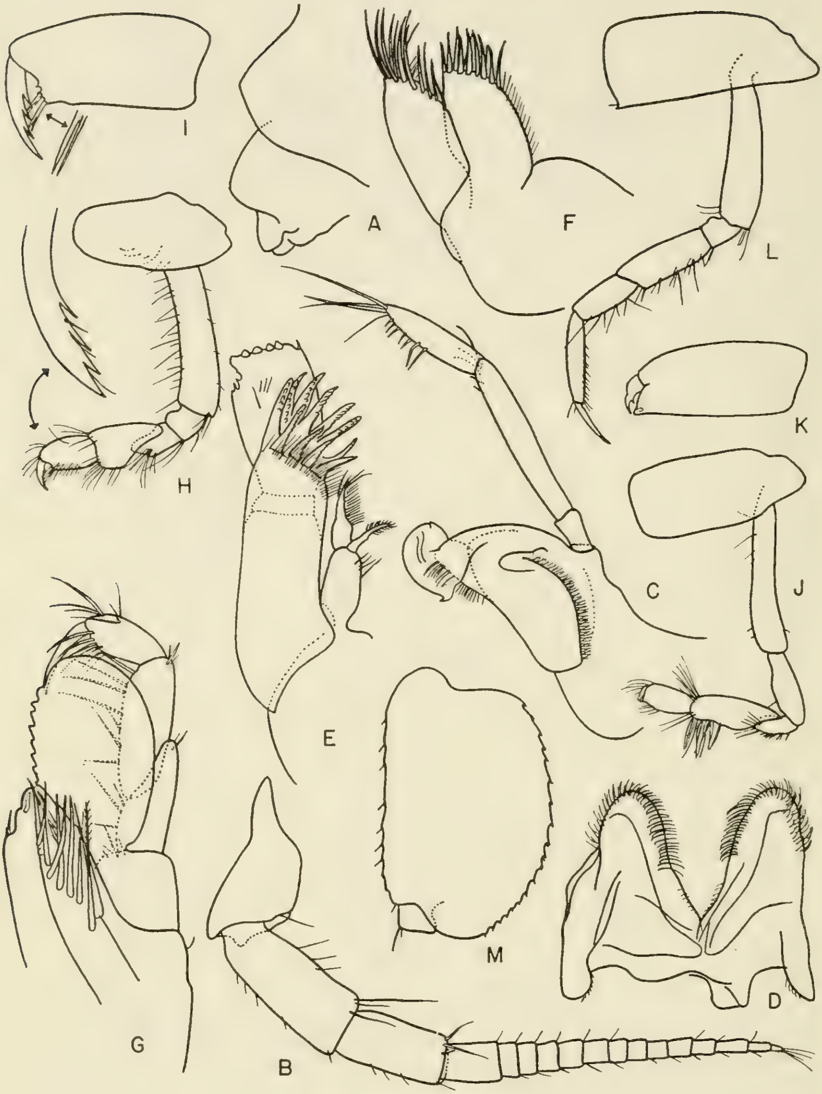



Figure 16
*Hirondellea fidenter*, new species. Male, 4.7 mm, sta. 6336: A, front of head and epistome-upper lip complex; B, antenna 2; C, mandible; D, lower lip; E,F, maxillae 1, 2; G, maxilliped; H,I, gnathopod 1; J,K, gnathopod 2; L,M, pereopods 1, 4.


Figure 17

*Lepidepecreella charno*, new species. Holotype, female, 4.5 mm, sta. 6091; A, lateral view; B, head with epistome-upper lip complex shaded; C,D, antenna 1; E, antenna 2; F, lower lip; G,H, maxilla 1; I, maxilla 2; J, maxilliped; K, gnathopod 1; L, gnathopod 2; M,N,O,P,Q, pereopods 1, 2, 3, 4, 5; R,S,T, uropods 1, 2, 3; U, telson; V, mandible.

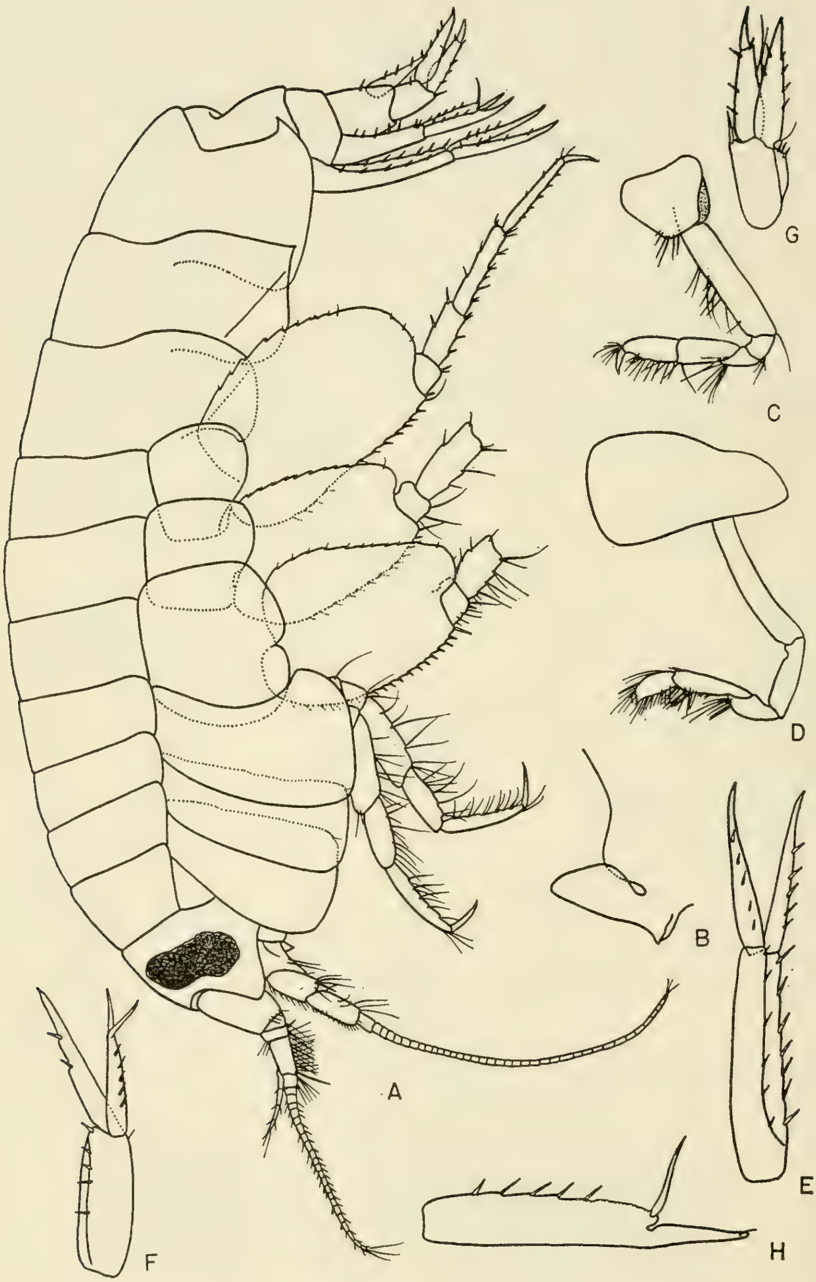



Figure 18
*Schisturella cocula*, new species. Holotype, male, 6.7 mm, sta. 5996: A, lateral view; B, upper lip and epistome complex; C,D, gnathopods 1, 2; E,F,G, uropods 1, 2, 3; H, inner ramus of uropod 2.

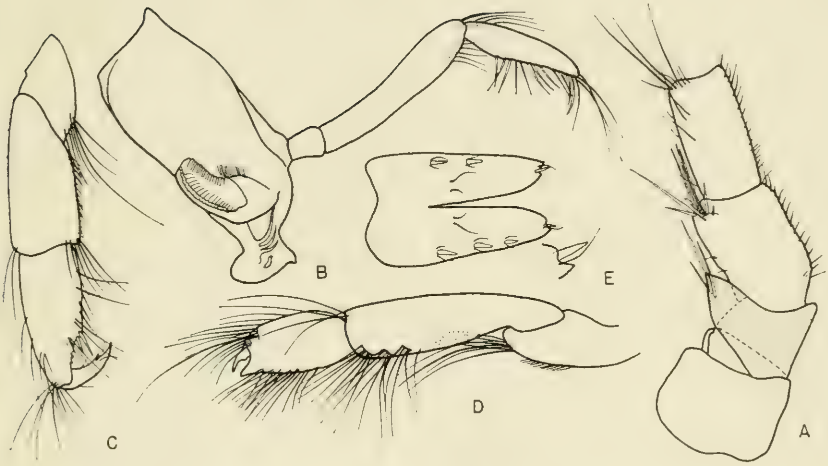



Figure 19

*Schisturella cocula*, new species. Holotype, male, 6.7 mm, sta. 5996: A, base of antenna 2; B, mandible; C,D, ends of gnathopods 1, 2; E, telson.


Figure 20

*Schisturella zopa*, new species. Holotype, 2.9 mm, sta. 2847: A, lateral view; B, head and epistome-upper lip complex; C,D, antennae 1, 2; E, mandible; F, maxilla 1; G, inner plate of maxilla 1; H, maxilla 2; I, maxilliped; J,K,L, gnathopod 1; M,N, gnathopod 2; O, pereopod 1; P,Q,R, uropods 1, 2, 3; S, inner ramus of uropod 2; T, telson.


Figure 21

*Sophrosyne robertsoni* Stebbing and Robertson. Female, 8.0 mm, station 6832: A, lateral view; B,C, mandibles; D,E, first maxillae; F,G, second maxillae; H, maxilliped.


Figure 22
*Sophrosyne robertsoni* Stebbing and Robertson. Female, 8.0 mm, sta. 6832: A, head; B, urosome (pleonal segments 4, 5, 6); C, antenna 1; D,E, gnathopod 1; F,G,H, gnathopod 2; I, pereopod 1; J,K,L, uropods 1, 2, 3; M, telson.


Figure 23

*Thrombasia tracalero*, new genus, new species. Holotype, male, 4.5 mm, sta. 2789: A, lateral view; B,C, uropods 1, 2; D, inner ramus of uropod 2; E, uropod 3; F, telson.

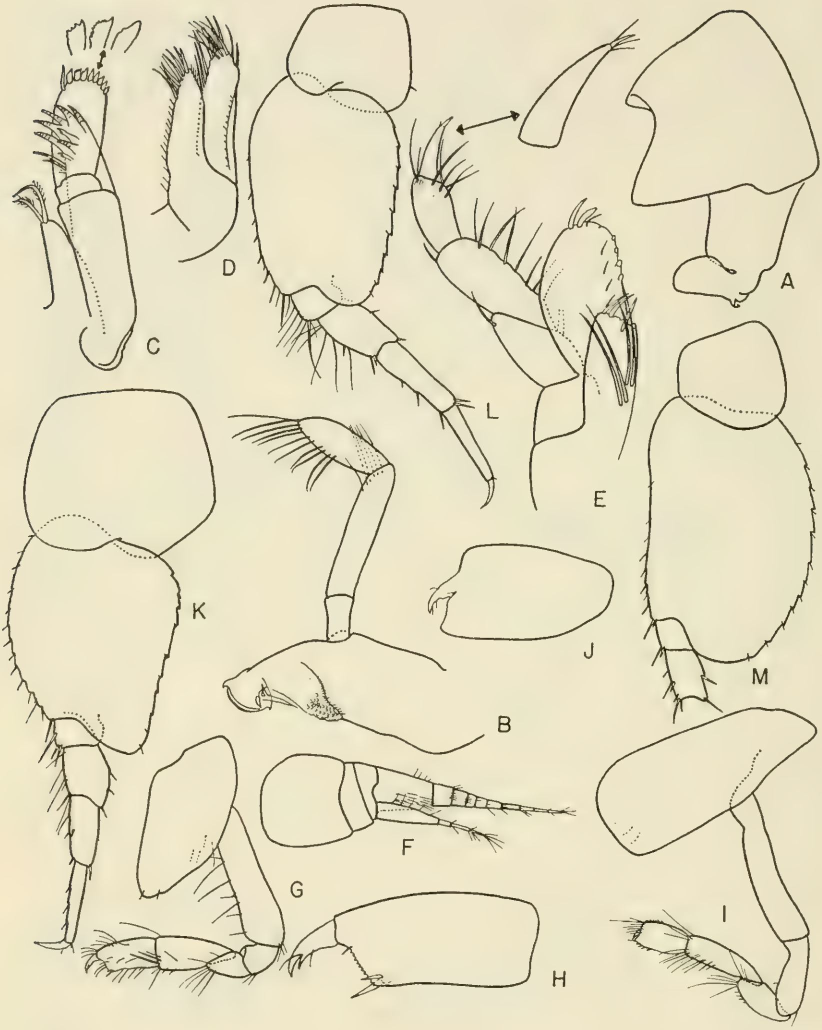



Figure 24

*Thrombasia tracalero*, new genus, new species. Holotype, male, 4.5 mm, sta. 2789: A, head and epistome-upper lip complex; B, mandible; C,D, maxillae 1, 2; E, maxilliped; F, antenna 1; G,H, gnathopod 1; I,J, gnathopod 2; K,L,M, pereopods 3, 4, 5.


Figure 25
*Tryphosa index*, new species. Male, 6.5 mm, sta. 6840: A, lateral view; B, head and epistome-upper lip complex; C, outer plate of maxilliped; D,E, gnathopod 1; F,G, gnathopod 2; H, pereopod 2; I,J,K, uropods 1, 2, 3; L, telson.

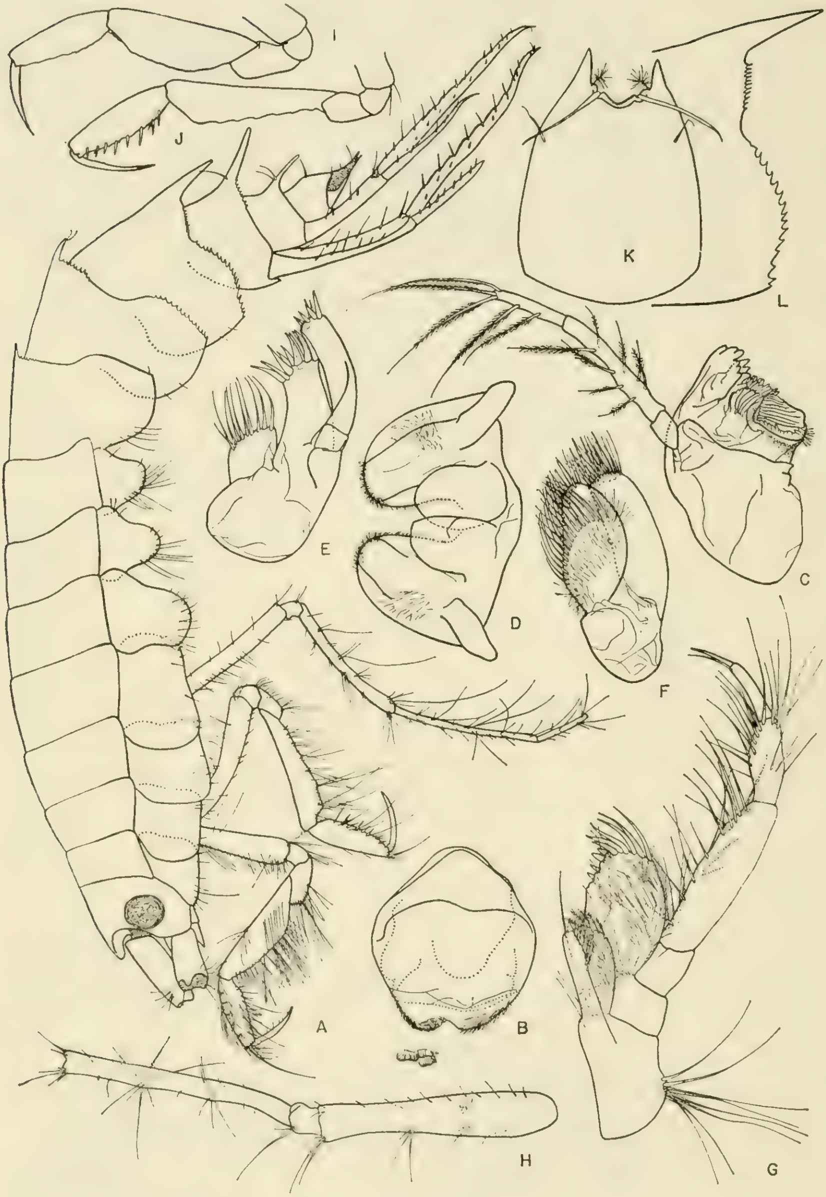



Figure 26

*Melphidippa* (?) *amorita*, new species. Holotype, female, 6.4 mm, sta. 6836: A, lateral view; B, upper lip; C, mandible; D, lower lip; E,F, maxillae 1, 2; G, maxilliped; H, pereopod 4, right side; I,J, gnathopods 1, 2; K, telson; L, enlargement of third pleonal epimeron.


Figure 27

*Bathymedon covilhani* J. L. Barnard. Male, 7.0 mm, sta. 6820: A, head; B, antenna 1; C, epistome; D,E, mandible; F,G, gnathopod 1; H,I, gnathopod 2; J,K,L,M,N, pereopods 1, 2, 3, 4, 5; O, telson; P, metasome.

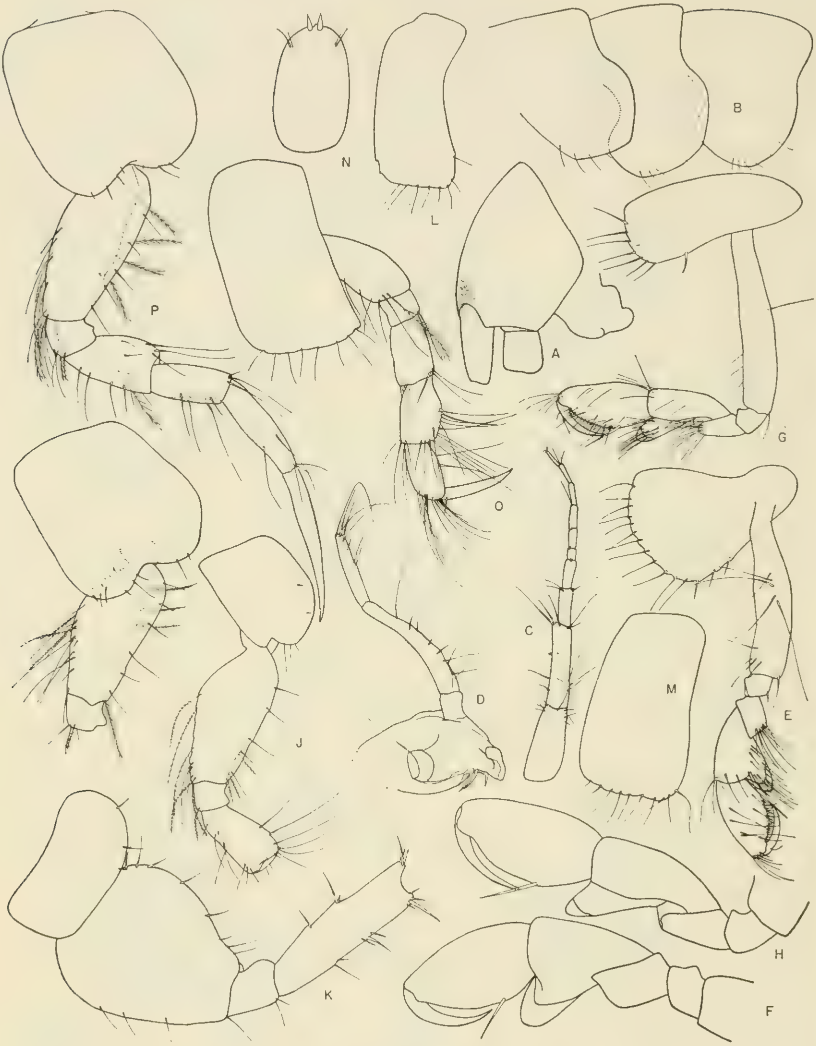



Figure 28
*Bathymedon kassites*, new species. Holotype, female, 3.2 mm, sta. 6494: A, head and epistome; B, metasome; C, antenna 1; D, mandible; E,F, gnathopod 1; G,H, gnathopod 2; I,J,K, pereopods 3, 4, 5; L,M, coxae 3, 4; N, telson. Female, 3.0 mm: O,P, pereopods 1, 3.


Figure 29

*Monoculodes latissimanus* Stephensen. Female, 3.0 mm, sta. 6819: A, head: B, metasome; C,D, gnathopods 1, 2; E,F,G,H,I, pereopods 1, 2, 3, 4, 5; J, telson.

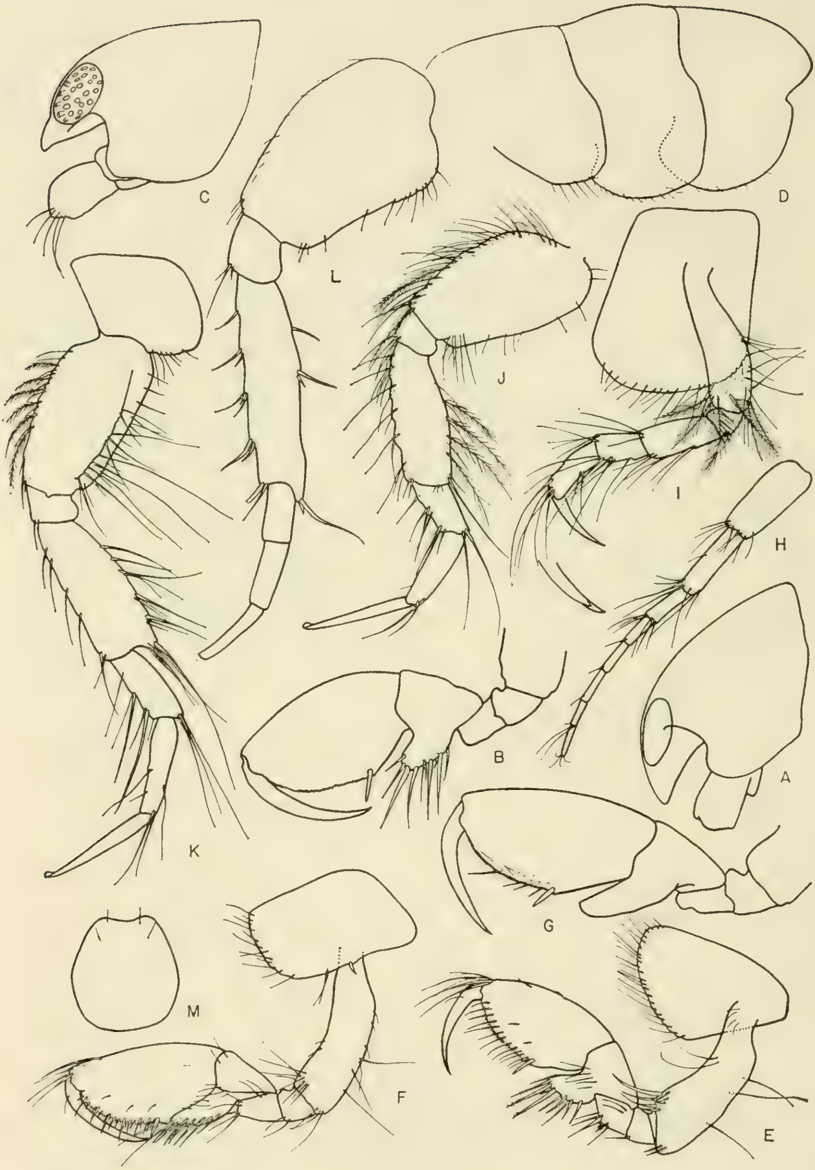



Figure 30

*Monoculodes perditus*, new species. Holotype, male, 2.7 mm, sta. 6845: A, head; B, gnathopod 1. Male, 2.9 mm, sta. 6845: C, head; D, metasome; E, gnathopod 1; F,G, gnathopod 2; H, antenna 1; I,J,K,L, pereopods 1, 3, 4, 5; M, telson.

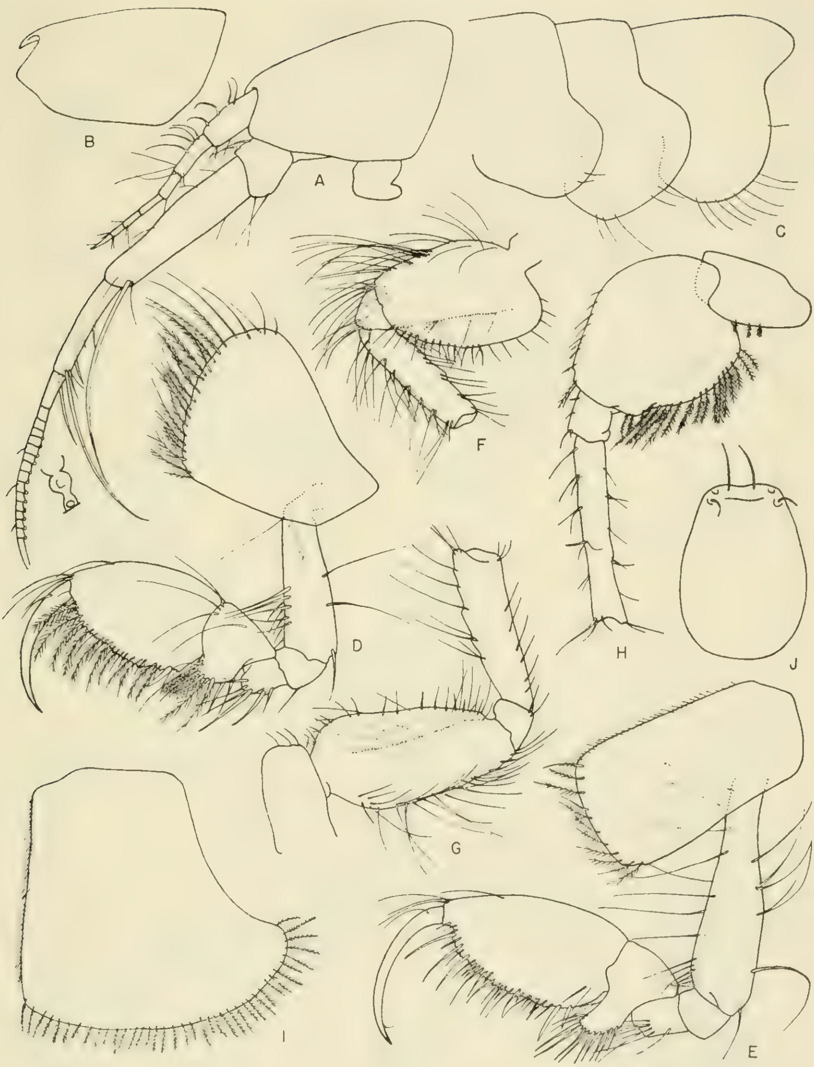



Figure 31
*Oediceropsis (Paroediceroides) elsula*, new species. Holotype, female, 3.6 mm, sta. 6837: A,B, head; C, metasome; D,E, gnathopods 1, 2; F,G,H, pereopods 3, 4, 5; I, coxa 4; J, telson.

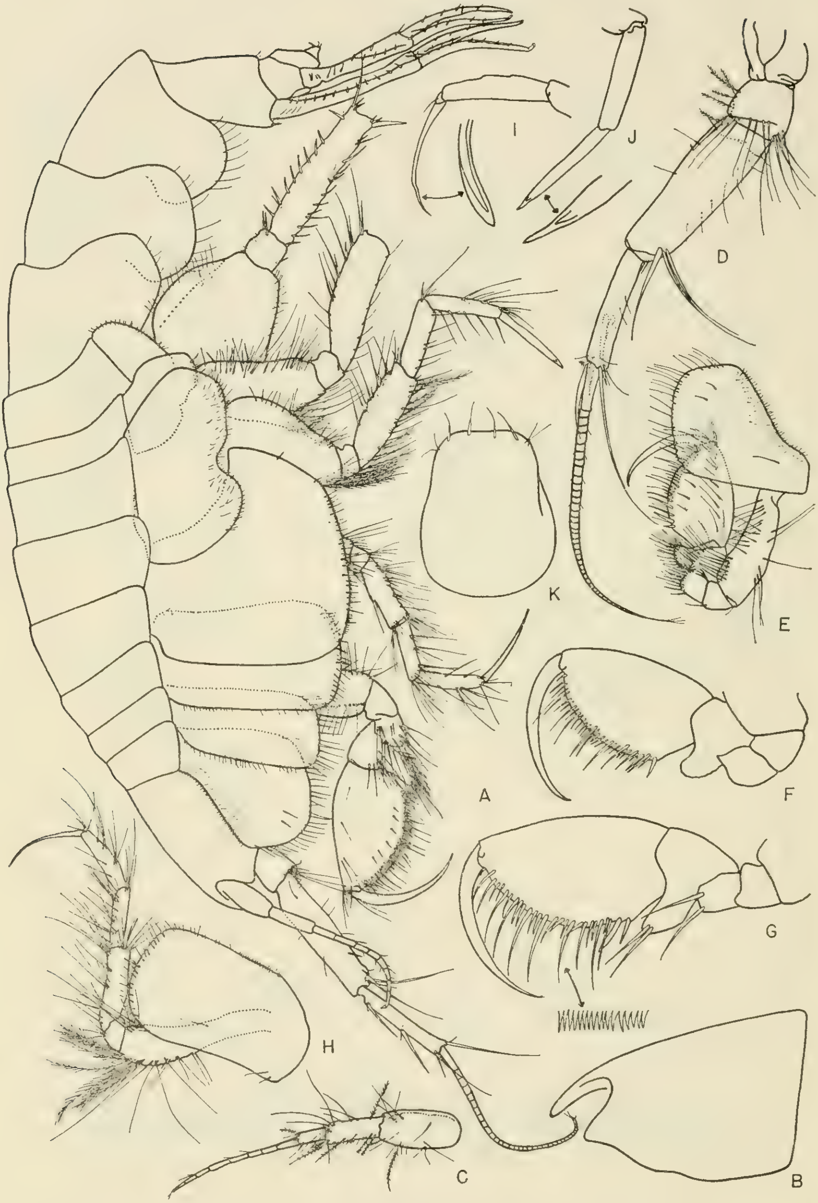



Figure 32
*Oediceropsis (Paroediceroides) morosa*, new species. Holotype, female, 5.5 mm, sta. 6833: A, lateral view; B, head; C,D, antennae 1, 2; E,F, gnathopod 1; G, gnathopod 2; H, pereopod 1; I, J, ends of pereopods 1, 3; K, telson.

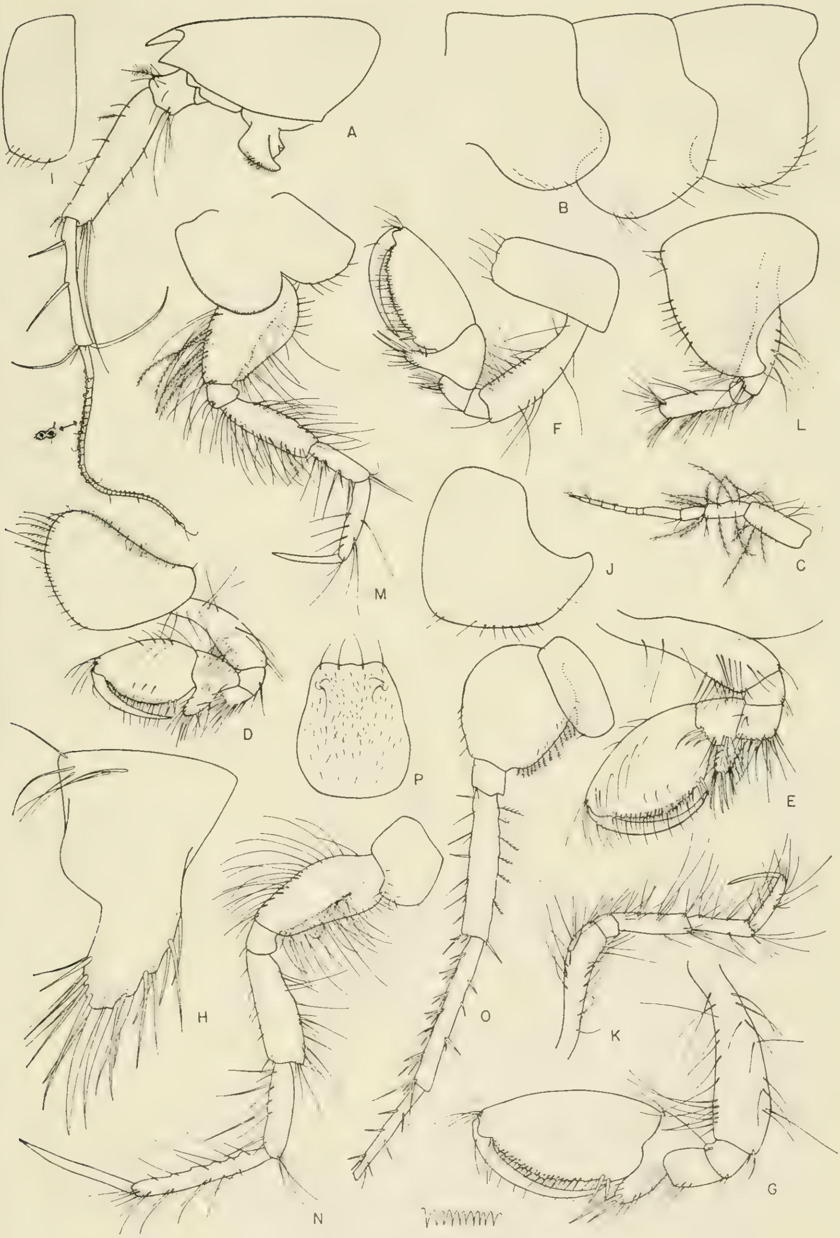



Figure 33
*Oediceropsis (Paroediceroides) trepadora* J. L. Barnard. Male, 5.0 mm, sta. 6839: A, head; B, metasome; C, antenna 1; D,E, gnathopod 1, lateral and medial views; F,G, gnathopod 2, lateral views; H, article 5 of gnathopod 1, lateral view; I,J, coxae 3, 4; K,L,M,N,O, pereopods 1, 2, 3, 4, 5; P, telson.

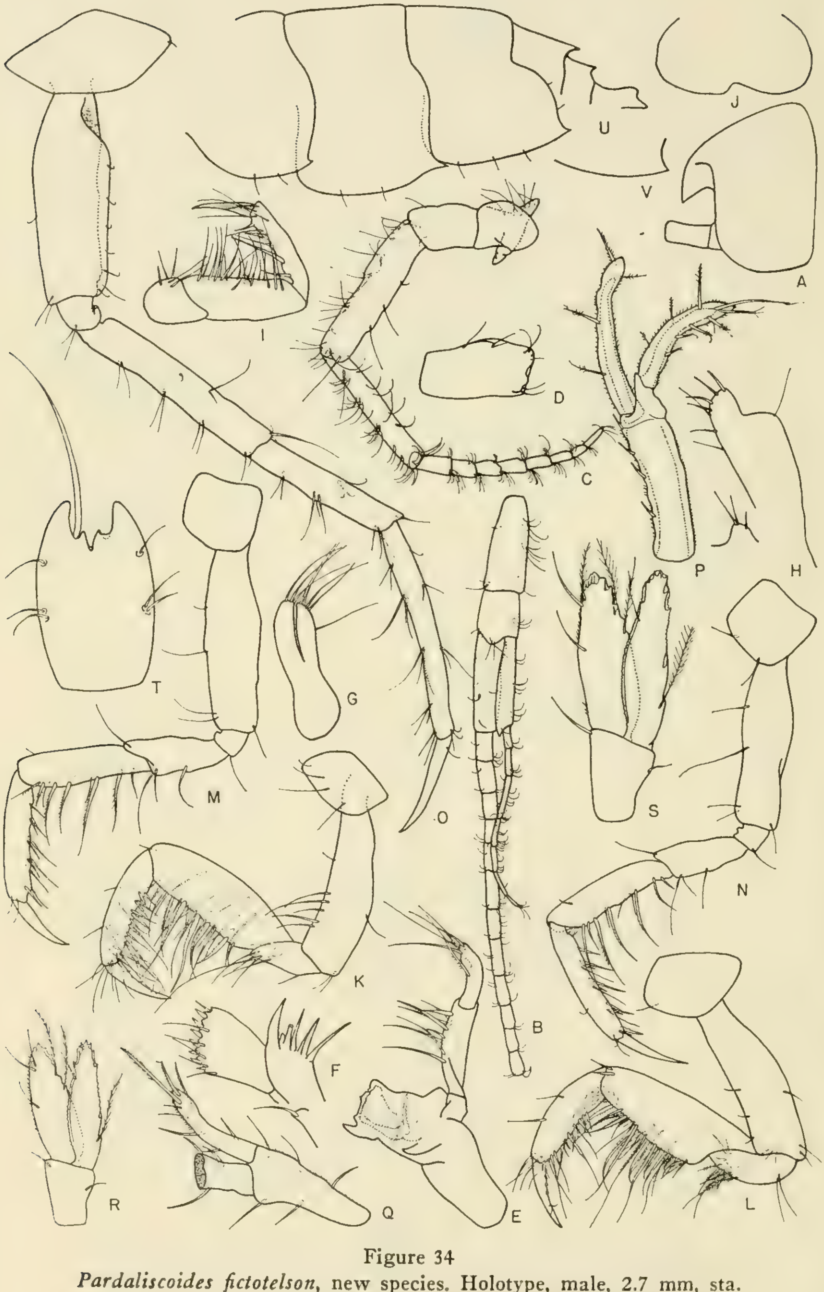



Figure 34

*Pardaliscoides fictotelson*, new species. Holotype, male, 2.7 mm, sta. 6805: A, head; B,C, antennae 1, 2; D, article 1 of antenna 1, base toward left; E, mandible; F,G, maxillae 1, 2; H, plates of maxilliped; I, palp of maxilliped; J, upper lip; K,L, gnathopods 1, 2; M,N,O, pereopods 1, 2, 4; P,Q,R,S, uropods 1, 2, 3, 3; T, telson; U, pleon; V, second pleonal epimeron from opposite side of animal.

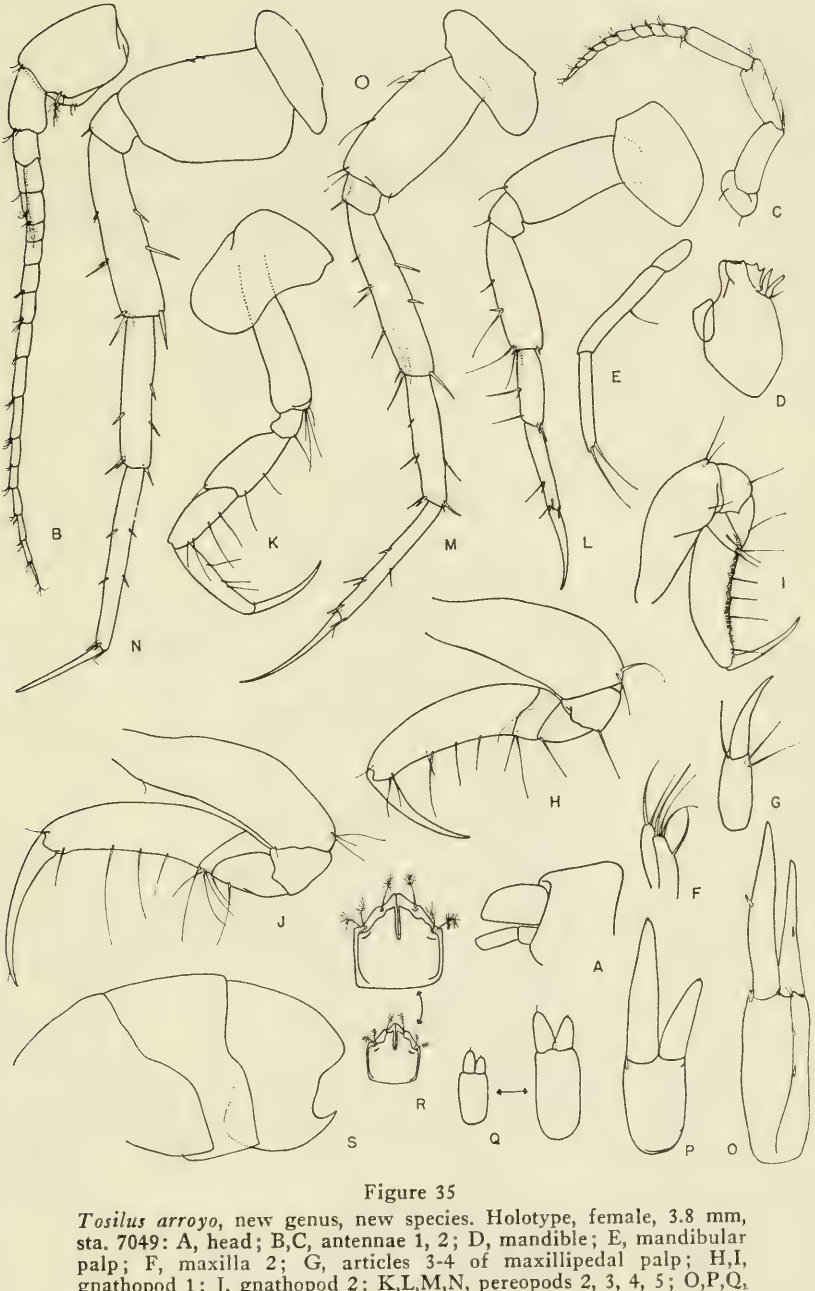



Figure 35
*Tosilus arroyo*, new genus, new species. Holotype, female, 3.8 mm, sta. 7049: A, head; B,C, antennae 1, 2; D, mandible; E, mandibular palp; F, maxilla 2; G, articles 3-4 of maxillipedal palp; H,I, gnathopod 1; J, gnathopod 2; K,L,M,N, pereopods 2, 3, 4, 5; O,P,Q, uropods 1, 2, 3; R, telson; S, metasome.


Figure 36

*Protomedeia* (?) *prudens*, new species. Holotype, male, 7.4 mm, sta. 7038: A, lateral view; B,C, gnathopod 1; D,E, gnathopod 2; F, pereopod 1; G,H,I,J, uropods 1, 2, 3, 3; K, telson.


Figure 37
*Coxophoxus hidalgo*, new genus, new species. Holotype, male, 4.0 mm, sta. 5943: A, lateral view; B,C, gnathopods 1, 2; D,E,F,G, pereopods 1, 3, 4, 5; H, telson.

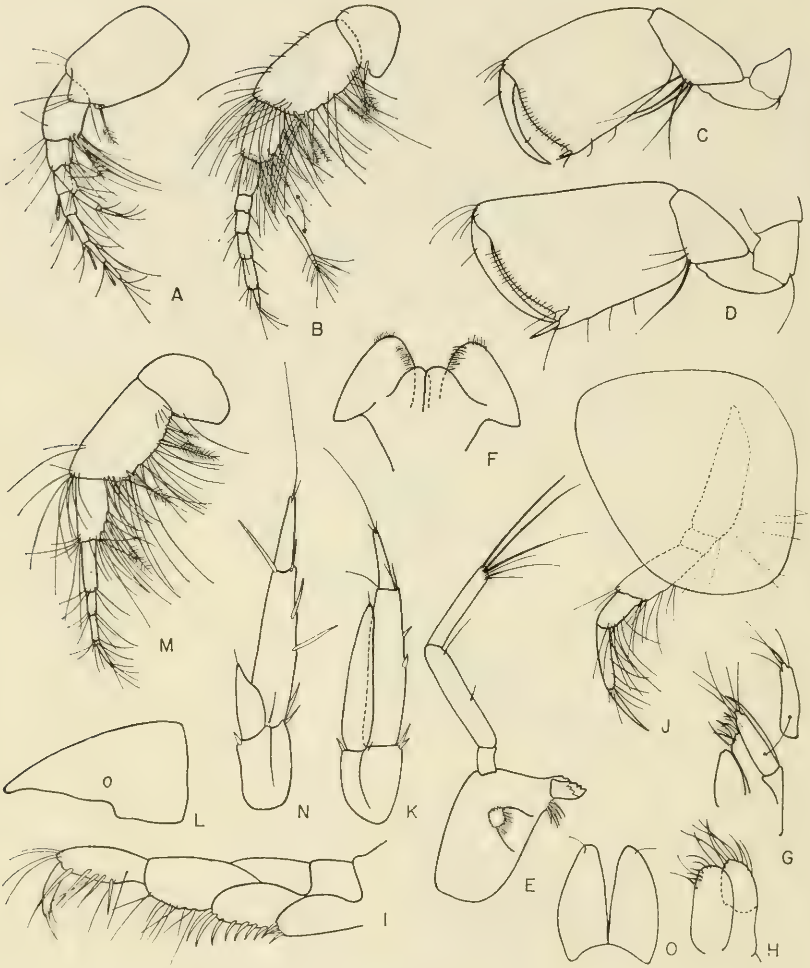



Figure 38

*Coxophoxus hidalgo*, new genus, new species. Holotype, male, 4.0 mm, sta. 5943: A,B, antennae 1, 2; C,D, gnathopods 1, 2; E, mandible; F, lower lip; G,H, maxillae 1, 2; I, maxilliped; J, pereopod 2; K, uropod 3. Female, 4.5 mm: L, head; M, antenna 2; N, uropod 3; O, telson.

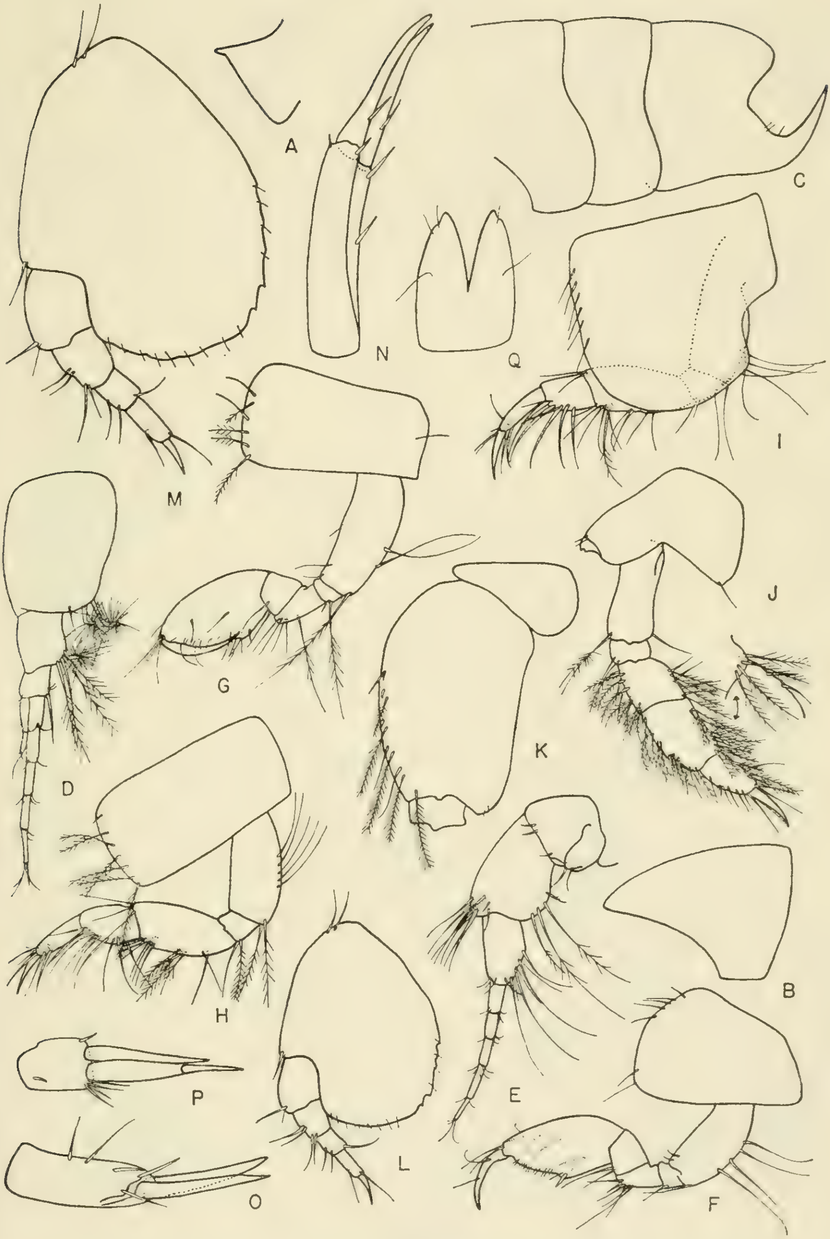



Figure 39

*Harpiniopsis petulans*, new species. Holotype, female, 4.5 mm, station 6842: A, epistome; B, head; C, metasome; D,E, antennae 1, 2; F,G, gnathopods 1, 2; H,I,J,K,L, pereopods 1, 2, 3, 4, 5; M, pereopod 5, enlarged; N,O,P, uropods 1, 2, 3; Q, telson.

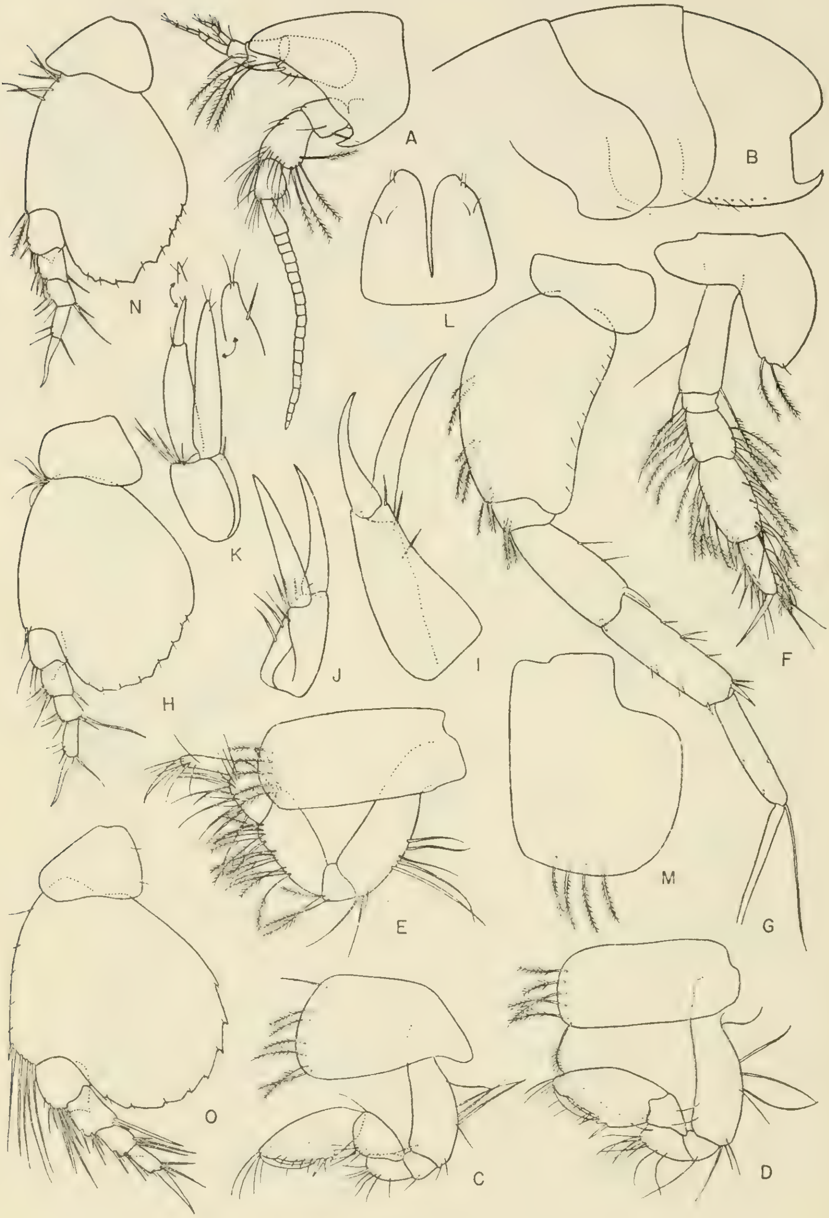



Figure 40

*Harpiniopsis profundis* Barnard var. Holotype, male, 4.8 mm, sta. 6832: A, head; B, metasome; C,D, gnathopods 1, 2; E,F,G,H, pereopods 1, 3, 4, 5; I,J,K, uropods 1, 2, 3; L, telson; M, coxa 4. Female, 3.6 mm: N, pereopod 5. *Harpiniopsis excavata* Chevreux. Female 5.0 mm, sta. 6833: O, pereopod 5.

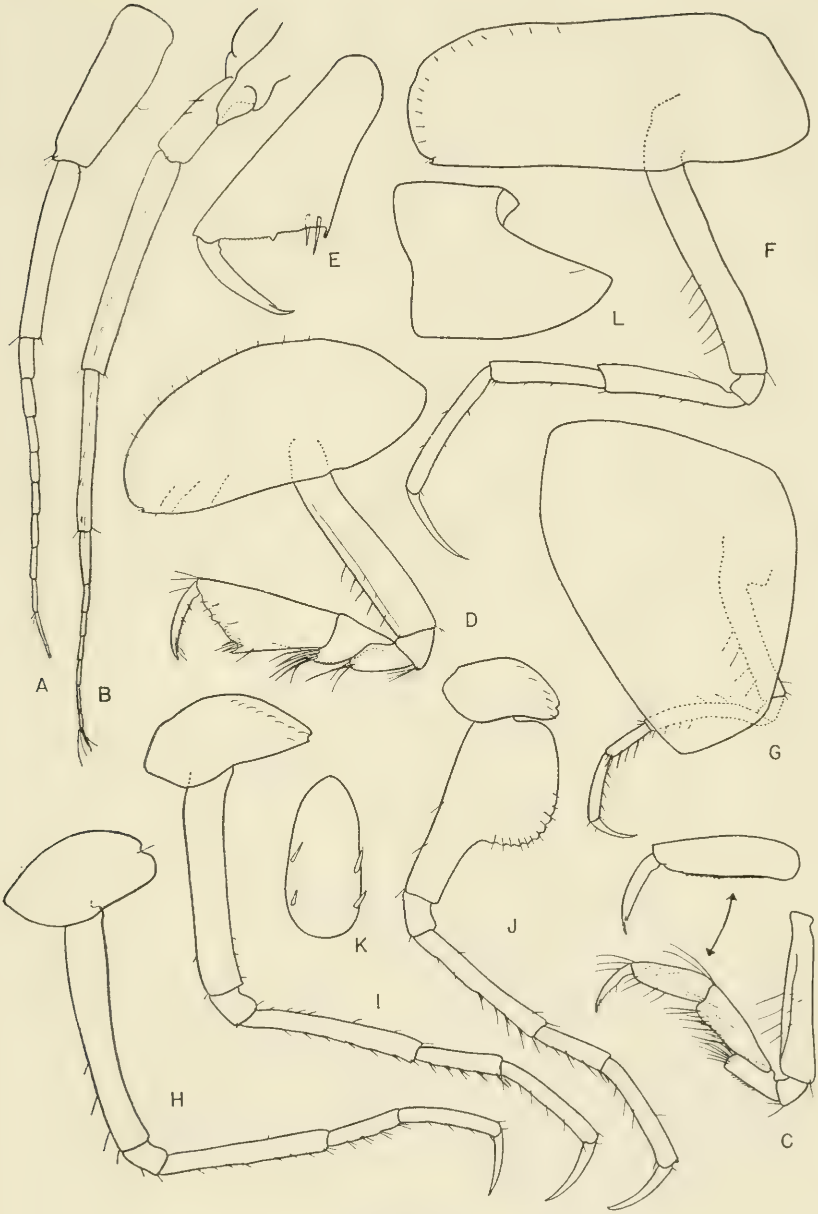



Figure 41

*Mesometopa neglecta roya,* new subspecies. Holotype, female, 3.0 mm, sta. 6806: A,B, antennae 1, 2; C, gnathopod 1; D,E, gnathopod 2; F,G,H,I,J, pereopods 1, 2, 3, 4, 5, pereopod 2 *reduced in size;* K, telson; L, third pleonal epimeron.

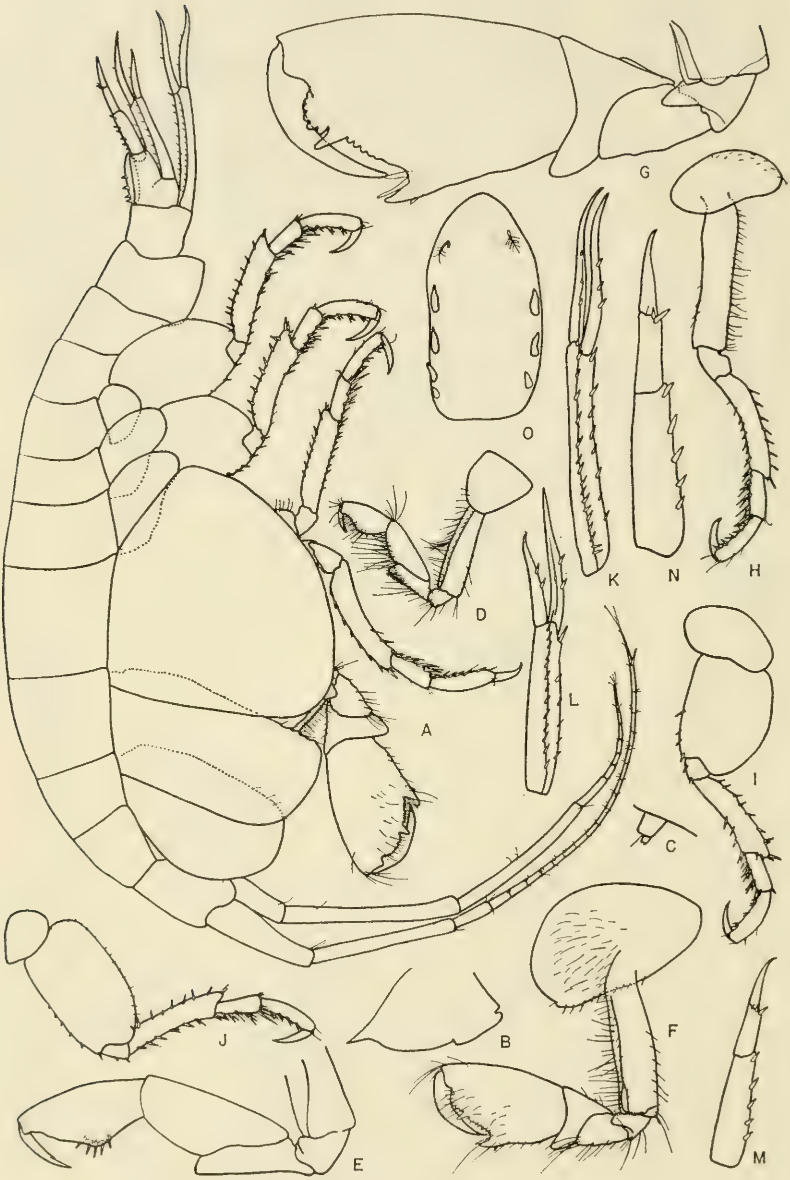



Figure 42

*Metopa samsiluna,* new species. Holotype, female, 4.5 mm, sta. 6840: A, lateral view; B, epistome; C, accessory flagellum; D,E, gnathopod 1; F,G, gnathopod 2; H,I,J, pereopods 3, 4, 5; K,L,M,N, uropods 1, 2, 3, 3; O, telson.

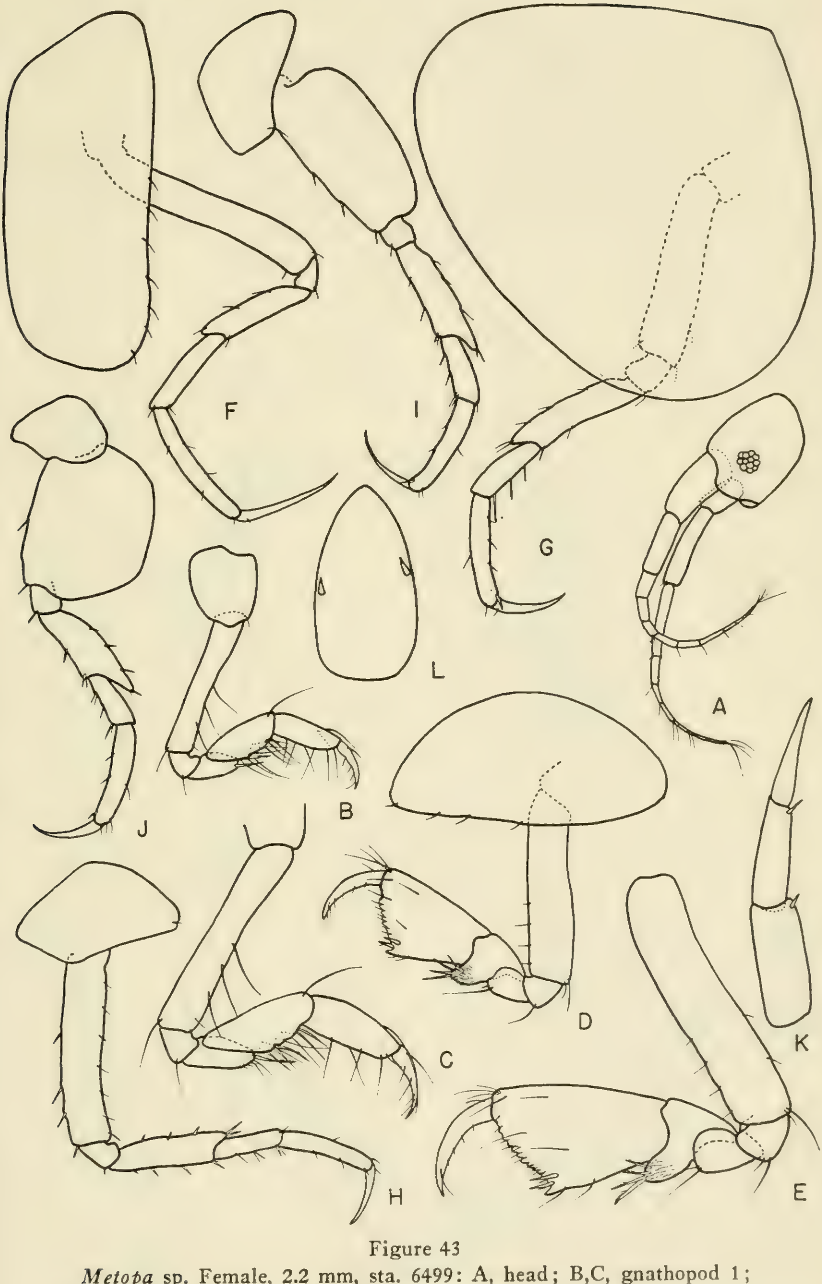



Figure 43

*Metopa* sp. Female, 2.2 mm, sta. 6499: A, head; B,C, gnathopod 1; D,E, gnathopod 2; F,G,H,I,J, pereopods 1, 2, 3, 4, 5; K, uropod 3; L, telson.

Figure 44
*Proboloides tunda* J. L. Barnard. Male, 3.5 mm, sta. 7290: gnathopod 2 and enlargement of palm.

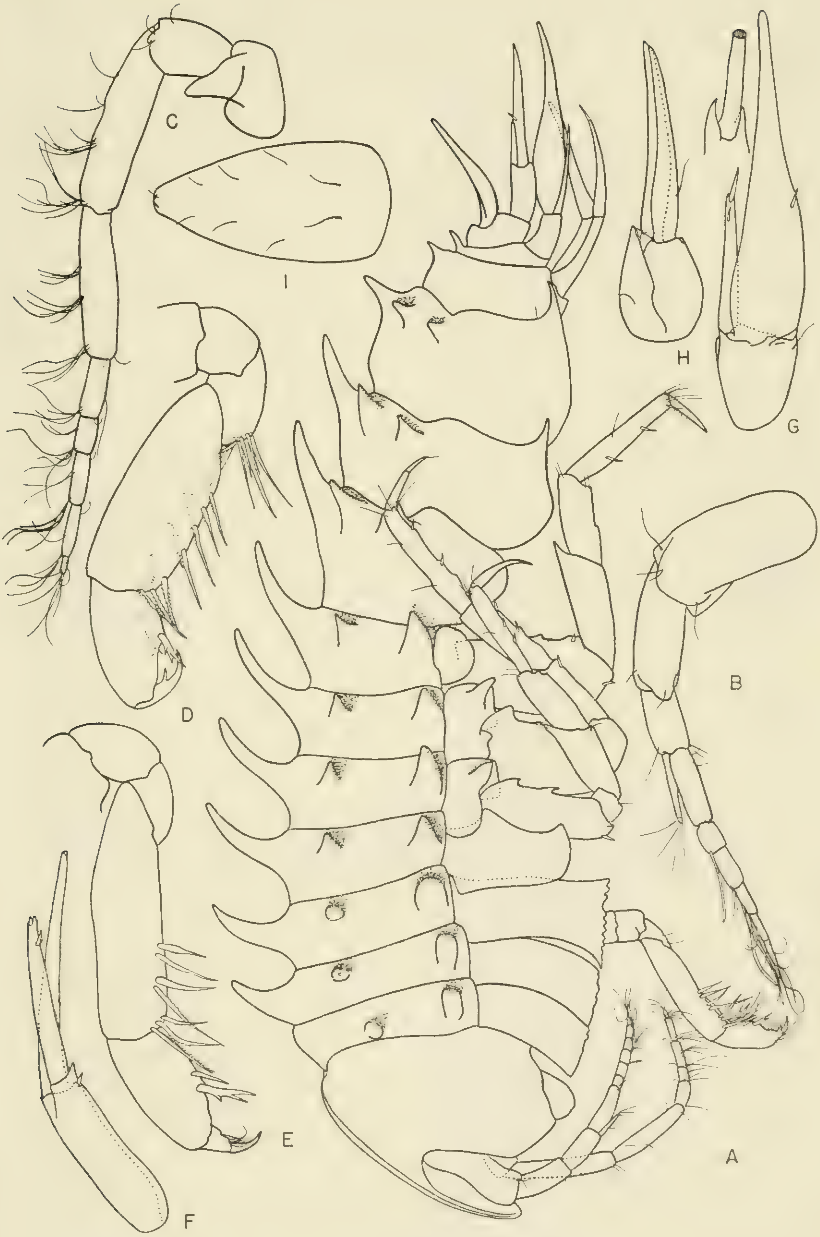



Figure 45

*Bruzelia ascua,* new species. Holotype, male, 4.7 mm, sta. 5938: A, lateral view; B,C, antennae 1, 2; D,E, gnathopods 1, 2; F,G,H, uropods 1, 2, 3; I, telson.

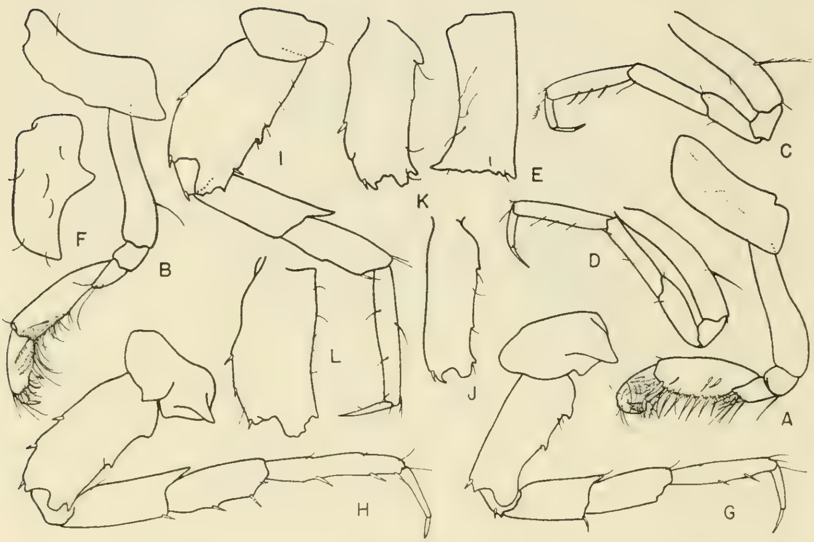



Figure 46
*Bruzelia ascua,* new species. Holotype, male, 4.7 mm, sta. 5938: A,B, gnathopods 1, 2; C,D, pereopods 1, 2; E,F, coxae 3, 4; G,H,I, pereopods 3, 4, 5, left side of animal; J,K,L, second articles of pereopods 3, 4, 5, right side of animal.

# INDEX OF SCIENTIFIC NAMES

(Numbers in **boldface** type refer to plates)